

SUPPLEMENT.

The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

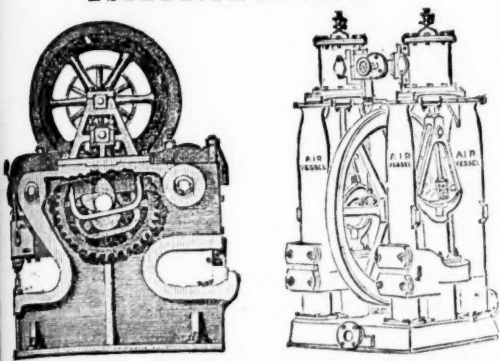
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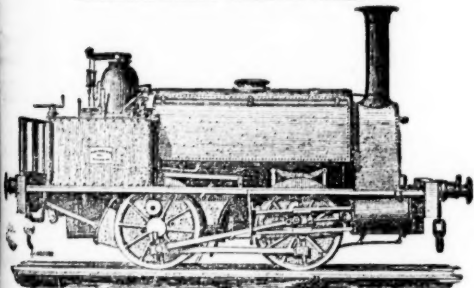
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PARIS,
BRONZE MEDAL, 1867.



ORDER OF THE CROWN OF PRUSSIA.



FALMOUTH,
SILVER MEDAL, 1867

A DIPLOMA—HIGHEST OF ALL AWARDS— given by the
Geographical Congress, Paris, 1875—M. Favre, Contractor, having
exhibited the McKean Drill alone as the MODEL BORING MACHINE
for the ST. GOTHARD TUNNEL.

SILVER MEDAL of the Highland and West of Scotland
Agricultural Society, 1875—HIGHEST AWARD.

At the south end of the St. Gothard Tunnel, where

THE MCKEAN ROCK DRILLS

Are exclusively used, the advance made during eight consecu-
tive weeks, ending February 7, was 24'90, 27'60, 24'80, 26'10,
28'30, 27'10, 28'40, 28'70 metres. Total advance of south head-
ing during January was 121'30 metres, or 133 yards.

In a series of comparative trials made at the St. Gothard Tun-
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against the rock—a result of itself indicating many advantages.

The GREAT WESTERN RAILWAY has adopted these
Machines for the SEVERN TUNNEL; the LONDON AND
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NEL; and the BRITISH GOVERNMENT for several Public
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using them. Shafts and Galleries are driven at from three to
six times the speed of hand labour, according to the size and
number of machines employed, and with important saving in
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where the rock is hardest.

These Machines possess many advantages, which give them
a value unapproached by any other system of Boring Machine.

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USE THROUGHOUT THE WORLD FOR MINING, TUN-
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most portable—the most durable—the most compact—of the
best mechanical device. They contain the fewest parts—have
no weak parts—act without SHOCK upon any of the operat-
ing parts—work with a lower pressure than any other Rock
Drill—may be worked at a higher pressure than any other
—may be run with safety to FIFTEEN HUNDRED STROKES
PER MINUTE—do not require a mechanic to work them—are
the smallest, shortest, and lightest of all machines—will give
the longest feed without change of tool—work with long or
short stroke at pleasure of operator.

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open work. Their working parts are best protected against
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are the most efficient.

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Is excessively light, and can be carried by one man, who can
with the No. 1 size (weighing only 35 lbs.) drill 40 holes
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- 1.—THEY ARE CHEAPER THAN ANY OTHER KIND IN FIRST OUTLAY.
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FROM 5 TO 10 PER CENT. OF ORE OTHERWISE LOST, IS SAVED.
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Mr. BAINBRIDGE, C.E., of the London Company's Mines, Middleton-
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chinery being occupied for some months in dressing ore stuff from the mines. Of
course, if it had been wholly engaged in dressing wastes our returns would have
been greater; but it is giving us every satisfaction, and bringing the waste heaps
into profitable use, which would otherwise remain dormant."

Mr. T. B. STEWART, Manager of the Duke of Buccleuch's Mines,
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and satisfactorily than by any other method."

Mr. BAINBRIDGE, speaking of machinery supplied Colberry Mines,
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wages we have now to pay. Over and above the saving in cost is the saving in ore,
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GREENSIDE MINE COMPANY, Patterdale, near Penrith, say—"The
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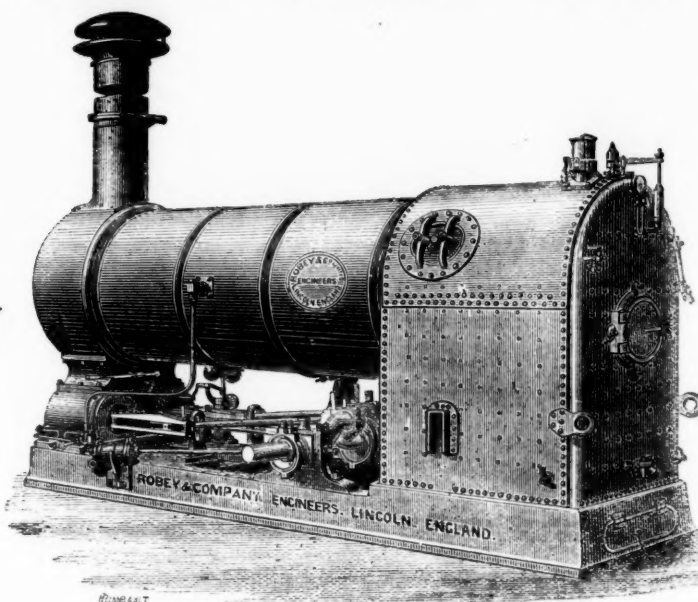
Mr. C. DODSWORTH says—"It is the very best for the purpose
and will do for any kind of metallic ores—the very thing so long needed for dress-
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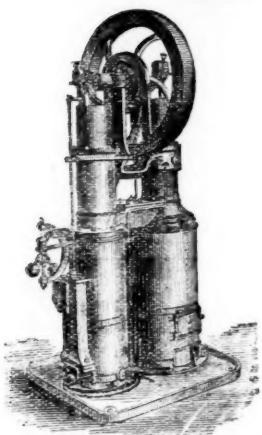
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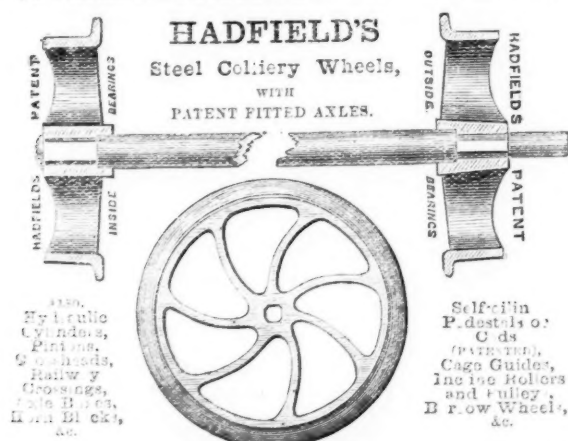
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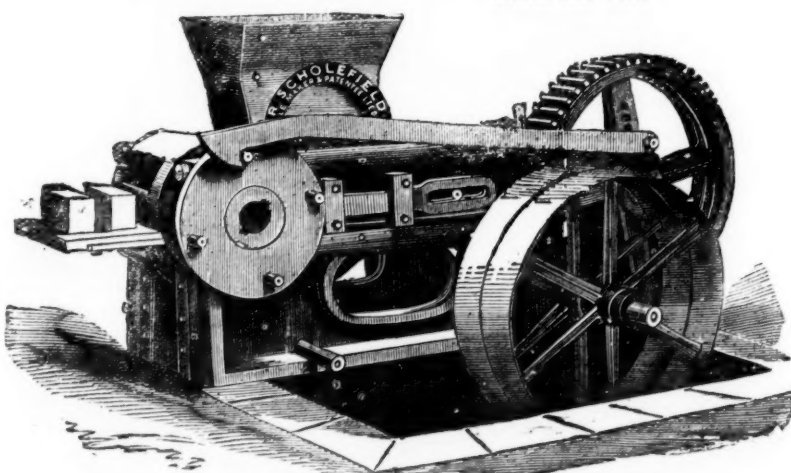
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R. SCHOLEFIELD'S LATEST PATENT BRICK-MAKING MACHINE.

PATENTED 1873.



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MACHINE, and the economical meth-
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machinery from the refuse that is
taken from the pits during the pro-
cess of coal-getting, which, instead
of storing at the pit's mouth (and
making acres of valuable land use-
less), is at once made into bricks,
at a very small cost, by R.S.'s Pa-
tent Brick-making Machinery. If
the material is got from the pit hill
the following is about the cost of

production, and the hands required to make 10,000 pressed bricks per day:—

2 men digging, each 4s. per day	8 0
1 man grinding, 4s. 6d. per day	0 4 6
1 boy taking off bricks from machine, and placing them in barrow ready for the kiln, 2s. per day	0 2 0
1 boy greasing, 1s. 6d. per day	0 1 6
1 engine man, 5s. per day	0 5 0
1 man wheeling bricks from machine to kiln, 4s. per day	0 4 0

Total cost of making 10,000 pressed bricks £1 5 0, or 2s. 6d. per 1000.

(SETTING AND BURNING SAME PRICE AS HAND-MADE BRICKS.)

N. 7.—Where the material can be used as it comes from the pit, the cost will be reduced in digging.
As the above Machinery is particularly adapted for the using up of shale, bind, &c., it will be to the advantage of all Colliery Owners to adopt the use of the
said Brick-making Machinery.

THE MACHINES CAN BE SEEN IN OPERATION AT THE WORKS OF THE SOLE MAKER AND PATENTEE DAILY.
SCHOLEFIELD'S ENGINEERING & PATENT BRICK MACHINE WORKS
KIRKSTAL ROAD, LEEDS.

Original Correspondence.

THE COURSE OF THE METAL TRADE—

TIN, COPPER, AND LEAD.

This is a very important subject for the consideration of all persons engaged in mining, investors in mining property, and dealers in metals. No one ought to hold a large stock of tin, lead, copper, zinc, iron, &c., without the most earnest investigation of the course which the markets are running. It is not sufficient to know that we have imported so much of the superior metals, or of copper and iron ores; or that we have "re-exported" a greater or less quantity of the imported metals; or that the exports of productions from British mines, smelting-houses, and furnaces have increased or decreased in a given time. The great thing is to ascertain the course of the commerce in metals—for that is the only sure guide to the probable future. It is common enough to hear the remark, "The stocks of metal in hand are heavy, therefore they must be cheaper, and mining operations slower." But this is not always so; the reason for a shorter trade from the above premises is frequently what logicians call a *non causa pro causa*. Very large stocks may actually bring to us a greater demand for metals, by securing to us customers who would otherwise go elsewhere—in fact, it entirely, or very nearly so, depends upon the course the trade is taking. If from any cause, such as a change of traffic, in a particular commodity, or congeries of commodities, made of a certain metal becoming unfashionable, or something else considered *pro tempore* at least cheaper or more useful be substituted, our customers will not come to us for that metal or its manufactures, whether stocks be high or low. The course of commerce which has set in, and its *rationale* will give a tolerably clear insight as to the future, and will in many cases inspire our miners with sustained hope when there are low markets, large stocks, and despairing brokers.

This is a subject which has seldom been treated in the Journal, notwithstanding its importance, because it is only in comparatively long spaces of time that the subject can be efficiently reviewed. Adopting this plan, in the first place, with regard to tin, we find that imports increased from the beginning of 1872 slowly, but surely, although in 1874 they were slightly below 1873, but only to cause a large increase in 1875, in which the value was nearly one and a-half million. This year, judging from the past ten months, it will scarcely exceed one and a-quarter million. The only thing noticeable in the course which the import of this commodity has taken is the supply from Australia; as to the probability of its continuing to any great extent we need not here repeat the opinion which we have so recently given. There are no records kept of the places to which those portions of our imports which were exported were sent either in this or any other metal. These tables have been given in an imperfect form by the authorities at the Custom House, although several improvements in this respect have been recently made. The course which the export of British tin has taken and is taking is, however, easily defined. The United States had been the chief destination. For three years—1872, 1873, and 1874—the value averaged a-quarter of a million; but in 1875 the falling off was signal and sad, even one-half, and the decline continues. This has partly arisen from accumulation of stocks, from the general weakness of trade throughout the Union, the unsettled political, social, and commercial condition of the Southern States, and the mutability of tariffs. As far as we can see the trade in that direction it is not likely to revive for a long period, especially as it is reported tin has been discovered in the western slopes of the Rocky Mountains.

Tin enters to a considerable extent into machinery and mill-work, as does also copper; but, of course, neither to the degree in which iron and steel are used. There is undoubtedly an advance in this direction during the present year as compared with last; but, such as it is, it may be regarded as a partial revival, for in 1874 these exports to America fell off 65 per cent. as compared with 1873, and in 1875 12½ per cent. as compared with 1874.

Under the designation of Hardware a good deal of tin is exported, as well as of copper, brass, iron, and steel. This trade with the United States fell about 20 per cent. in 1874, and about 15 per cent. from that year in 1875; but, happily, there is here also a revival this year, the United States taking 30 per cent. more of the articles included under the generic name of hardware. It is not likely that the Union will very long continue to be large importers of either hardware or machinery, facilities for the production of the materials there being vastly on the increase and skilled workmen becoming more available. Next to America, France used to be our best customer for tin up to the end of 1874, but in 1875 there was a decline of more than 50 per cent. This is the more surprising as the imports of the Republic vastly augmented last year, because she had contrived since the peace with Germany to make the whole world her debtor. It is probable that her tin imports have been made directly from Holland. This year, however, there is a revival to a moderate extent—8 per cent. There has been an increase in our export of machinery and mill-work of all kinds solid and satisfactory, and the advance has been pretty fairly sustained this year. The hardware trade with France has been nearly stationary since the peace, but bears a fair proportion to that of other European nations. Germany has also been a good customer to us for tin, but has fallen off 30 per cent. in three years, the Dutch supplanting us in the German markets.

The decline in our trade with Germany for steam-engines, and, indeed, all other descriptions of machinery, has been rapid and determinate. In 1872 the value of the former was over half-a-million, in 1873 it was not a-quarter of a million. In other descriptions of machinery the value in 1872 was over one and a-quarter million, in 1873 a little more than three-quarters of a million. The training of German workmen in all departments of manufactures from metals has brought them to great proficiency. The decline in our hardware exports to Hamburg and the Hans Towns has been determinate and alarming. Turkey, formerly a good customer when the Porte could supply the wants of the Government by means of money borrowed from ourselves, has nearly ceased to import tin. Russia was also a good customer, but the exports this year so far have fallen 30 per cent. In 1872 she imported half as much more hardware as in 1873, and this year the decline is nearly 40 per cent. In steam-engines there was an increase of 50 per cent. in 1875 over 1872; other descriptions remained steadily at large values. These were our chief customers for tin, and they have fallen from us seriously, nor is there any immediate prospect of revival, but our colonial exports are improving, and as none of our colonies, except Southern Australia and Queensland, produce tin, we may hope among their growing peoples to make up for the defection of the United States, France, Germany, and Russia.

As to the Copper Trade the course of imports remains what it has been for many years—Chili, Australia, and the Cape send us nearly all we receive. The course of our copper exports has been mainly with France, Germany, Holland, Belgium, Russia, British India, United States, and Turkey. Reviewing the turn the trade is taking the United States presents the most remarkable phenomenon. Of our exports of machinery and hardware thither, and to France, Germany, and Russia we have written sufficiently in connection with tin, as copper is, like that metal, only an adjunct to iron and steel. But regarding our export of unwrought copper in ingots, slabs, and cakes, in 1872 was valued at nearly a-quarter of a million sterling. In 1873 it was 216,000*l.*, in 1874 it showed the extraordinary decline to 40,254*l.*, and in 1875 there was just 1 ton weight bought for the Union, for which, according to the Custom House returns, 89*l.* was paid—that took place early in the year; the value so far this year is only a trifle more. The discoveries of copper in North America will partly explain this, but neither letters from America nor the opinions of British merchants sufficiently solve the enigma. In unwrought or manufactured copper the decline from 1872 has been to one-fourth; this year the trade is a little better, being nearly as much as in the whole of 1875. With Holland and Belgium our copper exports have been declining for several years previous to the present, and during the last ten months it has continued to recede. France and Germany have since 1872 both steadily increased their

imports of British unwrought copper, and this steady increase continues to the present month. Germany is a considerable importer of our wrought copper; but France receives very little, though, small as the value is, it is progressive. British India is a good customer for both classes of the metal, and, although fluctuating, the trade is augmenting, and likely to augment still further. Russia has been a very large purchaser, but gradually takes less, this year so far only 93,000*l.*, against 129,000*l.* in the corresponding period of last year; and as it is in the second and third quarters, while the Baltic is free from ice, that her imports by sea are made there is no likelihood now that this year's trade with Russia will be a good one. Indeed, the revenue of Russia decreases, while her military expenditure is enormously augmenting. She has incurred a vast debt for railways, which do not pay, as they were constructed for military, not for commercial purposes. With Italy and Egypt we had a fair trade in this metal, but in each case it steadily and largely declines. Our exports to the Mediterranean have been rather less than in the same space of time last year. The prospects are that India, France, Germany, Holland, Belgium, and our colonies, except Australia, will in future mainly absorb our exports of this commodity.

By far our best customer for lead is China—year by year that trade advances greatly; but during the last nine months has received a comparative check, not from permanent causes, but stocks, especially at Hong Kong, had unduly accumulated. Next to China, Russia has been our best customer, and the trade increases. Both those nations use it for packing tea and for military purposes, and we are informed that there are already orders for Odessa, and for delivery in spring on the Neva. The United States was a large importer, but for several years the trade has been going down, and last year almost ceased to exist; but this year it has revived again inasmuch that we have sent out in the past ten months five times as much as during the whole of 1875. Australia buys our lead extensively, but it is a fitful trade; on the whole, however, growing, and destined obviously to become very much more extensive. With most other nations we do a moderate and steady business in the metal; but the course the trade will take is most probably China, Russia, India, Australia, France, and Germany.

We have, as briefly as so large a subject would admit, pointed out the course trade has been taking and is likely to take in the superior metals; it is for the enterprise of our merchants to seek new fields, and especially to cultivate our own colonial markets, such as those of Australasia, Canada, the West Indies, and the Cape.

IMPROVED SYSTEM OF METAL EXTRACTION.

A VISIT TO NEW CONSOLS MINE.

[SPECIALLY MADE FOR THE MINING JOURNAL.]

During the past couple of years very few mines have had so much attention paid to them as New Consols—at least, in the West of England. The energetic company by whom that extensive and valuable sett is worked have been the pioneer in a great work—the introduction into Cornwall of a system of metal extraction, which, although long practised in laboratories, and attempted at times to be put into practical application, has somehow yet failed elsewhere, of the success which New Consols has attained. The difficulties at New Consols have really been enormous; they have involved the creation of a new form of mining industry in the face of an amount of prejudice immense even from Cornwall. For those who know Cornwall best, and who value the practical skill of its miners most, must be among the first to confess that they are about the most conservative set of fellows in existence in all practical operations; they know that the old ways in which they were so thoroughly skilled were good ways, and they are very hard to convince that there are better, especially when the new ways proposed practically amount to a revolution on all previous order and experience. They have gone on for ages using no other means for the extraction of the metals from the ores with which the county abounds than mechanical processes, depending upon the operation of difference in specific gravity with the single exception of burning the mundic mixed with tin ore, in order that the arsenic and sulphur might be driven off, and the operation of the principles of specific gravity brought to bear more closely on the residuum. For ages tin was burnt without a thought of saving the arsenic thus driven off in poisonous fumes. It is quite within our day that the arsenic has been saved, and made a matter of commercial value. Everybody knows how that was pooh-poohed; and everybody knows, too, that in recent times of mining depression many a mine has been enabled to hold its head above water by the results of its arsenic produce alone. And so in later times when it was proposed to deal with low-produce ores, the valuable contents of which could not be extracted economically—in many cases not at all—by the ordinary mechanical processes, the same thing has occurred. First, the existence of some of the more valuable contents of these low-produce ores was denied; and then, when this had to be admitted, the idea that they could be profitably treated was utterly scouted. In fact, we are a long way even now from being out of the scouting stage. It has to be admitted that there have been circumstances connected with the practical introduction of this "wet" system of metal extraction, which have not been wholly favourable, and which have tended to increase the prejudice against it. But these by no means apply to New Consols; and anyone who pays the works there a visit will be compelled, whether he likes it or not, to admit that very remarkable results have been achieved, and that the door has been opened very widely indeed to the possibilities of a very prosperous future for the mining industry of Cornwall in the utilisation of that which has hitherto been almost wholly neglected, and which under the old system must perforce have remained so. We thus regard the New Consols Company as among the chief public benefactors of the county which Cornwall has seen.

Standing on the hill side above the New Consols account-house, and overlooking the valley below and the slopes of the opposite hill, one might be pardoned for doubting whether he had not made some mistake—whether the place to which he has been driven over rugged woodlands and along pleasant winding lanes, under the shade of woods whose luxuriant foliage is fast changing into the russet and golden tints of autumn; through wild ravines, and by the gorges where the Tamar and its tributaries wind towards the sea—whether this place so surrounded, and in itself so extensive and so unlike the ordinary aspect of mines, can be the place of which he has come in search. The whole valley is filled with buildings, and tramways, and inclines, and stretching up the slope on the opposite side are a range of low structures spreading out fanwise, in which he may be pardoned for not recognising at the first glance part of the 1½ mile of flues wherein the arsenic for the calciners is deposited. There is enough masonry and woodwork here to make a small town. This, however, is New Consols, and the whole of these buildings are not only devoted to the purposes of the mine, but the majority of them—in fact, nearly the whole of them—have been erected within the past three years in what was originally open fields. New Consols, in short, has ceased to be a mine only. Mining here is not mining merely, but a process of manufacture conducted upon principles which a very few years since nobody dreamt would be applied outside the laboratory in such a way. The history of the undertaking is full of interest and value. The New Consols sett, which includes West Great Consols, stretches away nearly 2½ miles from the Tamar; now the lode worked extends through the whole distance. The average width of the lode may be taken at 9 ft., but it increases in depth, and in places has been found as much as 35 ft. It underlies 2 ft. 6 in. in the fathom north, bearing 7° south of east. There are seven shafts sunk upon it, of which three are now in work. If all were in operation there would be no difficulty in raising 1000 tons of stuff per day. But the mine, as a mine, is really quite in its infancy, and its deepest point is only 96 fms. from the surface. It is evident, therefore, that with such a lode as we have described the quantity of stuff that may be raised is practically inexhaustible—at least, there is quite sufficient to last at the most rapid rate of working the time of anybody now on the concern.

Now this lode, though so large and so extensive, is simply a mundic lode. Exceptionally large it is true, but just such in quality of product as occurs in every part of the county, and, under the ordinary system of working, practically worthless. As an experiment some

of it was selected and dressed, and sent to Wales. It fetched 16*s.* per ton only, so that it is abundantly evident something more than the ordinary system would have to be adopted to make it pay. Yet on a low average each ton of stuff is worth 2*l.* That is to say it contains 1 per cent. of copper and 10 per cent. of arsenic, with 2 ozs. of silver and 7 lbs. of tin to the ton. Selection would bring up the average quality to 1½ per cent. of copper, 18 per cent. of arsenic, 4 ozs. of silver, and 12 lbs. of black tin, worth 3*l.* 4*s.* or so per ton. However, the company have proceeded on the lower estimate, and the problem they have set themselves to solve has been the extraction of the copper, silver, arsenic, and tin from lodestuff worth only 2*l.* a ton for all in combination, at a profit. Of course there have been even more than the usual amount of predictions of failure, seeing that the adventurers have so entirely departed from the ordinary mechanical method of separation as to substitute the "wet" or chemical process. They have, as already stated, many difficulties to contend with. They have had to extend their plant, as it became apparent that profitable results depended upon the largeness of the quantity of the ore stuff treated. They have laid out very little if at all short of 50,000*l.* on the permanent works, and as they have found the treatment of 36 tons a day to be so completely a commercial success that it has enabled them to meet cost, they are now engaged in reconstructing the company in order to raise additional capital for the extension of the works, so as to enable them to treat 50 tons a-day, which will leave a handsome profit; for, of course, there were a number of fixed charges that do not appreciably increase with the amount of work done up to a liberal limit, and 50 tons per day can be treated at a much cheaper rate per ton than 40 tons. Naturally, also, to carry on works of this kind, which are, as stated, less a mine than a chemical factory, a larger amount of working capital is required than would be the case in an ordinary mine, and this likewise is being provided in the re-construction which is now taking place. Though the company has been re-formed there will be very little change in its character. The holders of 55,000 out of the 60,000 shares into which the company was divided at once responded to the appeal made by the directors; the greater part of the additional capital is already forthcoming. Sir J. Anderson still continues chairman, Capt. R. Pryor the manager. Almost the only change made is in Mr. Satterthwaite having become the managing director.

It has taken the company nearly three years to work up to the present position. Capt. Pryor has been connected with the mine some 11 years. During the greater part of this time it was worked for tin, and proved very productive, yielding upwards of 40 lbs. of tin to the ton of stuff. New Consols was started as a copper mine, but Capt. Pryor having discovered the existence of tin in the mundic put up stamps and washed it for that metal, quickly returning 15 tons per month. Operations on the present principle commenced in February, 1874, and, as we have said, the company have gone on continually extending their plant and operations. The capital at first was 25,000*l.*, but the growing necessity of extension has caused this to be increased from time to time as the need arose. The last great extension was in July, when two of Oxland and Hocking's calciners, referred to hereafter, were erected. This doubled the mine's calcining power. From July 10 to Aug. 12, 1042 tons were calcined; from Aug. 13 to Sept. 9, 727 tons; from Sept. 10 to Oct. 14, 877 tons. In the same period the quantities treated in the lixiviating tanks were respectively 849 tons, 744 tons, and 1141 tons. During the last five weeks the average quantity roasted has been 35·82 tons a-day, including Sundays.

The mine is worked as cheaply as possible. Water-power is used wherever available, and, indeed, West Great Consols—now part of the New Consols sett—is wholly worked by a fine 50-ft. water-wheel, put up for the former company by Nicholls and Matthews, of Tavistock. There is an 80-in. pumping-engine at New Consols engine-shaft, and a 50-in. at Broadgate shaft; the latter, however, is not in work. The other engines in operation are—a 36-in. stamping-engine, pumping as well; a 20-in. engine driving the stone-breaker; a 26-in. winding-engine; and a 28-in. crushing-engine, driving two crushers.

One thing that at once strikes the visitor is the almost entire absence of coal smoke in the vapours issuing from the chimneys. In fact, so far as these latter give visible evidence of the products of combustion, operations might be in progress on a very small scale indeed. Enquiry, however, reveals the fact that for the engines, in calcining, in chloridising, and the other operations there are actually 400 tons of coal consumed per month. Where, then, is the smoke? Well, it is burnt. Every fire-place throughout the mine (and this is one of the illustrations of the attention paid to detail, so necessary if there is to be proper efficiency and economy) is fitted with Martin's smoke-consuming doors and Martin's fire-bars. The doors are a very simple expedient to regulate the admission of air to the furnaces while the fires are being fed. The fire-bars are square and of wrought-iron, loose on the frame. The fires are never poked, but the bars are turned with a key. This allows the ash to drop out, and keeps the passage clear, while the closeness of the bars allows of even exceptionally small coal being burnt with economy. The point is by no means one of minor importance.

We now proceed to describe the works in detail. There is no peculiarity in the method of working the mine itself. The underground operations are, in fact, all conducted in the ordinary way. When the orestuff reaches the dressing floor it is picked over, the small riddled, and jigged where necessary. The larger rocks are sent to the stone-crusher. There is one of Blake's famous machines, the largest in the county, and seems to do its work with a positive gusto which it is really good to see, crunching up masses of the hardest tin capel as if they were no more than knobs of sugar. At present the stuff goes direct from the stone-breaker to the crusher, but it is intended to carry the principle of separation further by adding an 8-foot picking table to the breaker. We need not stay to explain that it is highly desirable to send only such stuff to the crusher as will be likely to pay for the subsequent treatment, and that it is inevitable that the large rocks dealt with by the breaker must contain fragments of waste, of which it is most important to get rid.

From the breaker the stuff is trammed down the incline in wagons containing 1 ton each to the crushers. Of these there are two of the ordinary Cornish type occupying one house in the bottom of the valley. The first crusher, with which alone we have now to deal, prepares the stuff for the calciners, crushing to a fineness of four holes to the inch. A separation is effected in the crusher, the larger stuff going to the new calciners, and the smaller to the reverberatory furnaces.

When the company started calcining it was with the ordinary reverberatory ovens only. These it was quickly found, though increased to eight, could not get through the needed amount of work, and accordingly arrangements were made for the erection of two of Oxland and Hocking's patent revolving calciners, which were got to work on the 10th of July. These calciners are of the largest size, 30 feet in length and 5 feet in diameter; they consist of iron tubes lined with firebrick, and are kept slowly revolving by water-power. The two now in operation are inclined 7 inches, and the stuff being fed at the upper end gradually passes downward, parting with its arsenic as vapour on the way until it drops into a hopper by the side at the lower end. These calciners require very small quantities of fuel, and indeed have worked for days together with nothing more to sustain the combustion than the arsenic contained in the ore itself. The effect of adding these two calciners was to increase the quantity calcined from 18 tons a-day to 36. Now a third is being put up, which will increase the calcining power to 50 tons a day. This one will be placed on an incline of 17 inches. The preparations are well advanced, and it will soon be at work. The larger stuff from the crusher is used, as already stated, in the calciners; the smaller with the dust is treated in the reverberatory furnaces, as the draught in Oxland and Hocking's arrangement is considerable.

Calcining gets rid of the first and most bulky product—the arsenic. There still remains the copper, tin, and sulphur. There would be no difficulty in burning out the sulphur, but this has to be avoided, since the sulphur has a very important part to play in the next process—that of chloridising. In passing to the calciners the observ-

ant visitor will have noticed under a shed a great heap of a brownish gritty substance, apparently coarse sand or very fine gravel. Closer inspection shows that it is not sand, and the tongue test at once indicates its character. It is crushed rock salt—this is the chief agent in the chloridising. It is mixed with the calcined ore in varying proportions settled by the analysis of from 10 to 15 per cent., and then the mixture is trammed down the incline to the crusher-house, where the second crusher brings it down to a fineness of about nine holes to the inch, and at the same time thoroughly mixes it. This done the water-wheel, by which all the hauling at surface is done, speedily runs it back again up to the chloridising house, which is higher on the slope facing the account-house than the calciners.

Here there is a long range of Brunton's calciners, by which the chloridising is performed. The tramway enters the house on a level with the hoppers through which the calciners are fed. These calciners, it will be remembered by those who are practically acquainted with mining operations, are slightly convex discs, which revolve slowly, and down which the stuff under treatment travels from the centre to the circumference. There in all eight of these, two with 12-ft. and six with 14-ft. beds. Four more with 14-ft. beds are being added, and now in process of erection. The rationale of the operation of chloridising is simple enough. Salt is, of course, chloride of sodium. The sulphur in the ore liberated by the heat attacks and decomposes the salt, and enters into combination with the sodium, forming sulphate of sodium, which at present is a waste product of the works, but which by-and-bye will be utilised with a profit. The chlorine gas thus disengaged is absorbed by the copper and silver, and the result is that chlorides of these metals are formed. These chlorides are soluble in water, and their extraction forms the next stage in the proceeding; for this purpose the chloridised stuff is again trammed away, and still further up the hill to the lixiviating-house.

But before we follow it there the final process in connection with the chloridising demands attention. A considerable quantity of chlorine vapour, as a matter of course, passes off from the chloridisers. The law prohibits the discharge into the air of vapour containing more than 5 per cent. of chlorine gas. The New Consols management discharges barely 2 per cent. The remainder is absorbed in a water tower, erected on one of the highest points of the works. Here the vapour is forced into contact with the water spray, by which it is taken up, the result being a weak solution of hydrochloric acid. The water is pumped to the tower by a small Tangye pump.

The lixiviation and immediately succeeding process of precipitation are conducted in a capacious building—the largest on the mine—180 ft. long and 80 ft. in breadth, with annexes. It is exceedingly substantial, with a massive roof carried upon lattice trusses, of what is known as the Irish felt type. There are ten lixiviating tanks, each capable of containing 10 tons of stuff; and the lixiviating plant is, in short, quite capable of treating 200 tons per day. In these tanks the soluble chlorides are washed out with water in the ordinary way. The dilute hydrochloric acid resulting from the absorption of the chlorine gas by the water in the water tower, run down through pipes, is used to assist the process, and the water is brought by steam to a heat of 170°—sometimes as many as seven successive washings, each washing lasting two hours, are required to extract all the chlorides. The resulting liquor seems slightly green in colour as it passes out of the tanks, but is really, when clipped up, seen to be the colour of rich port wine. Unhappy would be the unwary wight who should drink it. The blade of a knife dipped therein is instantly covered with a ruddy deposit of metallic copper; and analysis reveals the fact that each pint of this tawny and really generous and full bodied, if not very palatable, liquor contains 600 grs. of copper and 5 grs. of silver. Roughly speaking, therefore, the copper has been concentrated from 1-100th to 1-15th. Its reduction to the metallic state is very easy. There are eight precipitating tanks, each 12 ft. square and 4 ft. deep. Into this the liquor flows, and the copper with it. The silver is precipitated by iron in the ordinary way. When removed from the precipitating tanks the wet precipitate is dried on beds heated by flues, and is then ready for the market.

It will probably occur to some of those who have followed our narrative of the operations step by step that the work thus stops short of what may be done. Here is a precipitate containing some 60 per cent. of copper and an amount of silver which, if smaller in quantity, is of about equal value, and which is sent to the smelter as it stands. Why should not the company extract the silver for themselves? It is a natural question, and one that very probably will before long need to be asked. The company have under contemplation undertaking the extraction of the silver, and this may be followed by the smelting of the copper. If arrangements can be satisfactorily made for this they will then be enabled to include in their undertaking all the processes of metal production, from the raising of the ore to the sending into the market of the metallic results, and, with all the processes, all the profits. The smelting of the copper precipitate involves no difficulty whatever, and would not require any large extension of plant. The silver can be extracted with almost equal ease, the process paying with even so small a quantity as 2 oz. to the ton. There is ample room in the great tank house for the inclusion of the silver extracting process, and for conducting the general operations on a very much more extensive scale even than at present. In a corner of this building is a very unpretending but very important department—the laboratory in which the analytical chemist of the company, Mr. Simmons, a gentleman who has had the advantage of the training of the Royal School of Mines at Freiberg, conducts the investigations and analyses on which the practical success of the conduct of the "wet" system of extraction depends.

But what of the tin all this while? Well, it has not by any means been lost sight of. It remains behind in the residuum of the lixiviating tanks, more concentrated and in an improved condition for extraction in consequence of the destruction of the wolfram in the processes previously undergone. There is not much wolfram at New Consols, but still there is a little, and we need not say it is a great advantage to have it got rid of. There is nothing special to note in the dressing of the tin. It is done in the ordinary way by stamping, buddling, and framing. There are 60 heads of stamps on the mine, but only 24 are at work. Since the mine ceased to be worked exclusively for tin the larger number has not been required, but if tin goes up substantially, and we hope and believe it will, employment might for some time be found for the whole on the huge mass of leavings which it would then be profitable to treat.

In passing over the works great heaps of greyish substance, in the distance resembling mortar, may have been observed, though probably they may not have attracted much attention. These heaps are arsenic as extracted from the flues. Knowing what they are, and what a vast potentiality of mischief, as well as of utility, they represent we regard them with respect.

Until a comparatively recent period the company used to sell the arsenic in the crude state as taken from the flues—90 to 95 per cent. But between the prices of crude and of refined arsenic there is a very considerable margin, and this fact led to the establishment of arsenic refining works on the mine, which are the most complete in the county, and are equal to the production of 150 tons of refined arsenic per month. The arsenic is re-sublimed in four reverberatory furnaces, and deposited in a series of flues and chambers, which extend far up the hill side behind the furnace-house. These chambers are 45 in number, they are all built of brick, and fitted with iron doors, and are covered with a substantial roof, which is a great novelty. The chambers are worked alternately in two series. The arsenic (arsenious acid) deposited therein is as white as snow, and absolutely pure. All that has to be done with it further is to grind and pack it. The grinding is performed by an ordinary mill, fitted with French burrs, driven by a 4 horse power engine, and capable of grinding 12 tons per day. From the mill it descends in close sheets, ending in flexible tubes, which pass into holes in the tops of the barrels, so arranged that there shall be no waste, and, so far as possible, no arsenical dust floating in the air. The barrels while filling, in pairs, stand on a framework which gives them a continuous shaking motion. In this way the arsenic is closely

packed, so that each barrel contains about 3½ cwts. The masonry and woodwork of the grinding and packing building, as of all the others, are of the most substantial description. It is a fact worth noting that one may go through the whole of the works in active operation, and smell no arsenical fumes whatever.

Here, then, our narrative of the work done at New Consols must end. Every step taken throughout the various processes is thoroughly tested, examined, and checked. On one side of the valley is the laboratory, in which Mr. Simmons conducts his analyses in the wet way. On the other side, at the account house, is the assay office, where the stuff is dealt with by the ordinary dry process. Every day the produce and value of the work at the crushers, calciners, chloridisers, &c., is thus tested at different and regular intervals, and the figures duly recorded, and every day a statement of results generally finds its way to the London office. There could be nothing more systematic.

There are in all 180 hands employed on the mine. As we have already said, Capt. Richard Pryor is the manager, and deserves every credit for the energy, pluck, and ability with which he has conducted the details of this gigantic, costly, and as we have stated, successful experiment. His son, Capt. Joseph Pryor, is the resident agent, and an excellent specimen of the younger class of mine captains, skilled in science as well as in practice. The mine, too, enjoys in Mr. Simmons the advantage of a most efficient analytical chemist. Mr. Frank Michell is the engineer, and we need hardly say that, like everything else on the mine, the machinery is in excellent order. Indeed, no effort is spared to keep it up to the mark; a new boiler is being put in to replace one which it is considered has seen sufficient service.

THE EXCHEQUER GOLD AND SILVER MINING COMPANY.

SIR,—I cannot think that it is either right or expedient that our valuable property should be bolstered up with exaggerated or unsound statements. Kindly allow me, therefore, to play the part of devil's advocate in reference to the special meeting of shareholders held on the 1st inst. As I am a very large shareholder I can desire nothing so much as to be proved in error.

The Chairman informed us, in the remarks which he made after he had read Messrs. Mansell and Parrick's report, and had finished his series of questions to them, that we "had at present 151,371 tons of ore, which would average not less than \$50 per ton, and last for the next 14 or 15 years." No one corrected him, though our managing director, Mr. Syme, was sitting at his elbow, and Messrs. Mansell and Parrick immediately opposite to him. Yet it appears that Messrs. Mansell and Parrick's report only put our reserves in hand, averaging \$50 per ton, at 68,294 tons, which includes 37,557 tons above the 100 ft. level, where Mr. L. Chalmers told me, in writing, that he scarcely hoped to find any ore worth stopping, except a few hundred tons in the immediate neighbourhood of the winze, which includes the rich 140 ft. stopes; 35,000 tons is, therefore, the outside that we can legitimately get even out of their estimate; and, as they do not give us any reason for supposing that the whole area would pay to stop, even at the low "average width of 6 ft.," it seems reasonable to make a considerable discount, and to take (say) 10,000 or 12,000 tons as nearer the mark. This would last us, at most, about 18 months, instead of 15 years. In reference to this point, let it be noticed that 11 out of the 15 assays given are taken from the present stopes, and the remaining four from the ends of the 300 and 140, and absolutely none from the run of the levels, which yet constitute perhaps 19-20ths of the area from which Messrs. Mansell and Parrick get their 68,000 tons. Let notice also be taken of Mr. Mansell's statement, in answer to a question from me, that his "specimens were not picked, nor were they taken at random" (by "taken at random," I meant "not picked") so he evidently attaches a different meaning to the expression; but if they were neither what were they? Mr. Mansell gives us no clue as to how he satisfied himself that his specimens were a "fair average," or how it is possible to get a fair idea of the value of the property, especially when one is not an expert, except by taking specimens more or less at random but at regular intervals, and by applying the average thus arrived at only to the area within which such specimens shall have been so taken. Mr. Parrick's suggestion that one might in that way get some specimens of country rock instead of ore was evidently not made seriously, as he, though no expert, must know that if such a blunder were possible it would be at once detected and corrected by even a less experienced assayer than our manager. It would not have been surprising if there had been a laugh at this rather absurd remark, but I was not aware that there had until I saw it in your report, where its presence may be due to the liveliness and fertility of your reporter's imagination, clearly shown in other parts of his report of this conversation.

I then asked Mr. Mansell how he arrived at his average of \$50 per ton, to which question I did not get any satisfactory answer, but as he is so kind as to say, on page 1204 of your Journal, that he will have pleasure in supplying any further information that may be required perhaps he will do so now. At present it appears that he took 15 specimens, more or less carefully selected, from certain special and limited localities, of which he does not give us the extent, and then divided the result by an arbitrary number (about 10), in order to include the whole of the rest of the workings, which he has not sampled at all. He says that there is "much rich ore above this estimate, and very little below it," but this is very vague, and is not borne out by the facts, even so far as he has tested them. The areas out of which he got his specimens constitute a very small proportion indeed of the whole workings included in his estimate—how small we do not exactly know, as he has not told us. He seems to have found my question an awkward one, so Mr. Parrick came to his rescue, and tried to baffle me by asking me one about my own first telegram from Silver Mountain. As the shareholders had been invited to hear the result of Messrs. Mansell and Parrick's visit to the mine, and I not to hear me defend myself against a personal attack, and explain an old telegram, which they already knew all about, and as Mr. Parrick's question was clearly only a trick of fence, I did not feel justified in taking up the time of the meeting by answering it at length, and will only say now that Mr. Syme, who prompted Mr. Parrick in this matter, knew perfectly well that I had only yielded very reluctantly to his importunities that I should send a telegram as soon as possible after my arrival, and that my having made a mistake in it was mainly due to my having been deceived, unintentionally I verily believe, by another person before I had had time to check my own first impressions. He also knew that I had cancelled that telegram by wire as soon as I discovered my mistake. And what if I freely admit that I did, under pressure, send a foolish telegram? Is that a reason why Mr. Mansell should not tell us how he arrived at his \$50 a ton? If not, why was the question put to me? I ask Mr. Syme, as it was virtually put by him.

"Mr. Samuel Smith, a director," also came forth to Mr. Mansell's assistance, and interrupted me in the middle of my attempts to get an answer by reading a letter, which, though very interesting, had no more to do with the point than Mr. Parrick's (*adieu* Mr. Syme's) question had.

In connection with the conduct of the board in this matter, I may mention that I have been trying for more than six months to get a list of shareholders, which I am by law entitled to, from the secretary, in order that I might correct certain misstatements which had been circulated among the shareholders by the board, and have not yet succeeded.

In conclusion and recapitulation, I would remark that while Messrs. Mansell and Parrick have undoubtedly given us a great deal of useful and interesting information, for which we are infinitely indebted to them, they have, quite conscientiously no doubt, put forward two great fallacies—1. That in a mine of this class the results of assays of samples taken from one part of the mine afford any safe or exact indication of the value of any other part of the mine, however near. 2. That in a mine which has hitherto shown strong signs of the non-homogeneity of its ore samples taken from a stopes, unless taken absolutely at random, are any clue to a fair valuation of the ore in that stopes. On these two points I will, if you allow me, address you further next week.

A. JOY, M.I.C.E.

P.S.—I think I may fairly claim that you should allow me to

correct your report so far as it concerns me personally. What I said was substantially as follows:—I said that I had found (not "calculated") the ore in the upper tunnel to average \$10, and that no specimen had assayed above \$13, and I asked Mr. Mansell whether he had included the tunnel in his measurement of ore averaging \$50. Mr. Mansell answered, or some one else did so for him, and he did not correct the statement, that he had included nothing above the 100 ft. level. Whereas, we find in your report that he had included up to the level of the tunnel. I was speaking from memory, and on referring to my report I find that about 600 lineal feet of the tunnel averaged \$13.50 as the result of 19 specimens, and that the highest assay from the tunnel, exclusive of Hale's drift, gave \$20.64. My answer to Mr. Syme's question as to my having selected my specimens was "No; I picked them out (not "up") from the sides of the tunnel throughout its whole length, at random, as I went along." I ought to have added, "at equal intervals." In answer to Mr. Parrick's question about my telegram, I said, "That was cancelled afterwards, and fully explained in my subsequent report." Junior United Service Club, St. James's, Nov. 7.

THE NEW RIVER COMPANY, AND MINING.

SIR,—The Auction Mart has recently shown a remarkable instance of the growth in value of property in this country—a share worth 100% in the days of James I. has been proved under the hammer to be worth 94,000%. One-thirtieth part of a 100% King's share sold for 3135%; so recently as June last a similar share realised at the rate of 89,000%; while in 1870, just six years ago, the price amounted to 42,360%, and early in the last century the value was 7000%, or just seventy-fold the sum subscribed on the original share. The price just realised is at the rate of nine hundred and forty-fold the original capital subscribed in the days of James I. It is singular that this important company was started and matured by one of our most celebrated and successful miners, Sir Hugh Middleton, who acquired his riches from working the silver and lead mines of Cardiganshire, among others the Grogwinion and Cwmystwith, which are still at work, and promise to prove in the future equally important and profitable to the fortunate proprietors as they were in the unhappy days of James I. and the turbulent times of Cromwell. This increased value of nine hundred and forty-fold the cost price has been exceeded since, in a comparatively short period—say, a quarter of a century—by another fortunate miner, Mr. Josiah Hitches, the pioneer and discoverer of Devon Great Consols. This copper mine in Devonshire at one time sold for upwards of a thousand-fold the capital expended, and over the years 1846 to 1872 inclusive, yielded in dividends eleven hundred and sixty-five-fold the money subscribed—1,192,960%, upon a capital of 1024% only.

It is a curious calculation in contrast with the increased value of the New River shares and mining property. It is true that the mines which supplied Sir Hugh Middleton with funds to construct the New River into London are still at work, and in the case of Grogwinion paying substantial dividends, but the magnitude and importance of the New River Company have grown with the population and opulence of the metropolis, added to the trade and commerce and the wealth centered therein. If in the early part of the last century the 100% share was worth 7000%, the latter sum would, invested at 5 per cent. compound interest, be now swollen to the enormous amount of 7,168,000%, or, in round numbers, 100 original King's shares realised 140 years ago, and the proceeds invested at 5 per cent. compound interest, would now pay off England's National Debt. In fairness, however, to the increased value of 100 original King's own shares in the New River Company, from 700,000% 140 years ago, must be added all the dividends and compound interest thereon paid during that period. We have alone in the increased commercial value 9,400,000%, as against 700,000%, the worth of the 100 shares just (ten years) less than a century and a-half ago, but to this sum must be added 140 years' dividends and the compound interest at 5 per cent. thereon, which would doubtless far exceed in money value the indebtedness of the country.

I allude to this important water company simply to show that it had its origin in Welsh lead mining, and great as is the prosperity and value of the New River Company, the success at Devon Great Consols for a period of a quarter of a century wholly eclipsed it in brilliancy and results. It has passed, unhappily, from our vision as a first-class met- or, while the New River Company continues in all its increased value and importance, and will expand in inherent worth so long as the population and the trade, manufacture, and commerce of England augment.

R. TRIDINICK, Consulting Mining Engineer.

City United Club, Ludgate Circus, Nov. 6.

MANUFACTURE OF NICKEL FROM ITS OXIDES.

SIR,—The exceptionally pure character of the New Caledonian nickel-ores was pointed out in the letter of "F. K." published in the Journal of Oct. 21, and from the circumstance that other inventors are at present turning their attention to the treatment of this ore it is but reasonable to presume that French capitalists are disposed to develop the New Caledonian Mines; it will, therefore, be interesting to all to learn what is being done by French metallurgists to ensure the investments in that direction proving highly remunerative to all who may make them. It is upon these considerations that I forward you an account of an invention recently patented both in France and England by Mr. Jules Garnier, a civil engineer of high reputation and great experience in Paris, the special object of which is to treat a particular ore which is rich and abundant in the district, and has received the name of garnierite in honour of the invention of the present process. But it will, of course, be understood that other than garnierites may be treated by the same means. With regard to the nature of the ores, that which distinguishes the ores of New Caledonia is that they are chiefly composed of silica, oxide of nickel, and magnesia. Their impurities are clay, with a base of silica, magnesia, and iron, black oxide of cobalt, manganese, copper, and the like. According as the ores are more or less hydrated they have different appearances and properties, and they may be generally classified into two groups, the first comprising the slightly hydrated ores, compact of a beautiful green colour and very difficult to attack with acids; the second group, including ores largely hydrated (with as much as 23 per cent. of water), of a yellow, green, or bluish colour, friable, and easily attackable by acids. According to Mr. Garnier's process, the ore is sorted with great care in such manner as to divide it into parts of equal richness and quality, in order that it may produce in fusion classes of castings or mattes, each of which will have a uniform quality, but each of which differs from the others. He thus obtains mattes with a base nearly all nickel, and melting with a base of nickel, iron, manganese, cobalt, copper, and the like.

The ores thus classified will be subjected to a second operation. The solid fragments of nickel ore have sometimes no other impurity than ferruginous clay, in which case agitation in running water will be sufficient to remove a great portion of this gangue. Sometimes compact nickel ore is mixed with pebbles (serpentine and siliceous) all stuck together. A sorting by hand is sufficient to separate the useless parts from those which are rich in nickel. A variety of the ore, which is but little hydrated, is almost impregnable to the action of acids. It is one of the richest in nickel, and this fact alone has speedily caused a change of method with those manufacturers designed at first to treat exclusively by the wet method the ores of New Caledonia. This property in these ores of being almost impregnable to the action of acids permits the ferruginous and magnesian impurities to be attacked by means of acidulated water, in such a manner that the ore can be greatly enriched by a simple and inexpensive process.

In most cases it is necessary to grind the ores very fine, the friable and variable nature not otherwise allowing them to sustain the operations of fusion without considerable waste. The pulverised ores will be mixed with a flux calculated according to the laws of the dry method, so that the foreign particles which it contains will be separated by fusion and form a very liquid glass, the garnierite, which is always mixed with silica and magnesia, and uses a flux carbonate of lime or alkalies, fluor spar, borax, which garners a flux carbonate of lime or alkalies, fluor spar, borax, which it is to be used. To the mixture of the ore and its flux he adds quantity of coal dust, lampblack, or other reducing substance such

to effect the removal of the oxygen of the nickel. Other precautions are to be taken for this important operation, according to the method of reducing fusion which he employs. With regard to the method of manufacturing castings with a base of nickel, iron, manganese, chromium, titanium, and the like. This feature of his metallurgical progress is the obtaining of a melting or casting in which are concentrated all the metals contained in the ore. The castings may be obtained as follows, varying according to the places where the operation is to be carried on.

For the production of castings of nickel in crucibles the ore prepared as above described is formed into lumps, balls, or bullets of the size of a walnut by the addition of oil, tar, resin, or some other agglomerating reducing substance. The lumps or balls thus formed are dried in a stove before being put into the crucible. If the ore is free from iron there may be added thereto pure copper, either oxidised or carbonated, natural or artificial, which will facilitate the formation of the residuum, and will give at once an alloy of nickel and copper. In the same manner any other metallic oxide may be added to the ore with which it is desired to make an alloy. When the ore with the oxide of nickel derived from precipitate by the wet method is too poor in nickel to give easily a residuum of well united metal, because of the too great abundance of slag formed, instead of adding copper, as aforesaid, there should be added rich and pure iron ores to the nickel ores, the whole agglomerated, and the casting then deposited at the bottom of the crucible will form a compact residuum, owing to the presence of the iron, which will have attracted all the nickel in the same way that melted lead attracts gold or silver from poor ores.

The crucibles in which the fusion takes place are cemented over, and placed either on the hearths of reverberatory furnaces or furnaces similar to those employed for the fusion of steel, with a fire of either coke, gas, or oxide of carbon proceeding from generators, such as Siemens', Ponsard's, or the like. After a sufficient heat has been maintained for the requisite time, and a residuum is formed, on the top of which is its dross, the crucibles are withdrawn, and the melted metal poured out with the usual precautions.

Stamoa, Nov. 7.

R. F. Q.

LEGITIMATE MINING.

Sir,—I was very much pleased to see a letter from Mr. J. Y. Walsin, F.G.S., in last week's Journal, headed as above, and giving some particulars as to Bwlch United. Many years ago I was connected with the property, and although it was then only 50 fathoms from surface it returned as much as from 100 to 130 tons of rich silver-lead ore per month. This was all raised from the Goginan lode, and within 60 fms. of that boundary. Now, as the richest courses of ore worked in Goginan were obtained from 60 to 100 fms. below the present workings in Bwlch United, can any man in his senses for one moment imagine that the best of the ore ground has been worked away? I think not, and I doubt not now that it is taken in hand by a party who will work it legitimately that his efforts will be crowned with complete success.

As another legitimate concern, allow me to point out the next mine in the valley, and about 1 mile to the north of Bwlch United—Cwm Edin. This mine during the last working returned 1250,000Z. worth of silver-lead ore, and during the last few years gave a profit of from 30,000Z. to 40,000Z., having continued to pay profits up to the very last day of its working. It is only 50 fms. under adit that any work of importance has been done, and to anyone acquainted with mining it must be plain that the great course of ore worked away near the surface has dipped westward, and will be found by passing on the deep levels in that direction. The mine is well supplied with machinery for drawing, pumping, crushing, and dressing, which, together with the buildings, were erected at a cost of not less than 7000Z. The whole of these are now offered for 2000Z. cash and 2000Z. worth of shares in a capital of 10,000Z., which would be ample to bring the mine into a state of great prosperity. This mine is now being worked by the landowner, Mr. Jones, of Llwyn-y-Groes, near Llanymorfa. Can we not find another Mr. Waton to move this? I trust so, and that we shall soon see a response to this call.

The Pen-y-Bryn Mine, and also the Esgrair Fraith Mine, which are returned more than a million sterling worth of lead and copper ore, are now being worked by Messrs. Williams and Son, merchants, Merthyr, and are offered on similar terms, and it is to be earnestly hoped that some gentlemen of spirit and capital will come forward to work them as they should be; if so, we should again see Carmarthenshire mines opening out that were never supposed for magnitude of returns and profits.

ABSALOM FRANCIS,

Goginan, Nov. 7.

THE MINERAL WEALTH OF THE CALDBECK AND HESKET DISTRICTS.

Sir,—Having for some little time been a resident in Ireby, I have frequently taken the opportunity of exploring the surrounding districts, and have been surprised that so little mining enterprise has been entered into. Not far distant than about 1½ mile from the village is, in the opinion of all who possess any mining knowledge, a rich deposit of native iron ore, in the limestone formation, and the time cannot well be surpassed for quality. Adjacent to a coal seam that can be seen cropping out to the surface, and has been to a limited extent worked, but to no advantage, owing, I am informed, to want of capital to carry out the necessary arrangements of shaft sinking, &c. It is seldom, indeed, that such promising speculations have been for such a length of time allowed to lie dormant, though many reasons may be given why almost complete attention has been paid to these valuable properties.—1. The distance, railway (about ½ mile) on the Maryport and Carlisle line.—2. Heavy cartage, and difficulty in procuring household accommodation and provisions.—3. The entire absence of speculative men in the immediate neighbourhood, whose occupations are chiefly agricultural, and tastes adverse to speculation, and who are deficient in knowledge as regards mineralogical and geological science.

The most careful observer who possesses the slightest and most tentative geological lore can scarcely help being struck by the most valuable indications for a considerable distance exhibited on the whole area. Indeed, it would not be presumptuous to say that no other encouragement has been given even in the celebrated Cleator and Fringington districts. In many instances properties have been almost exclusively productive of the precious mineral where no such encouragement has been held out. Ore may be picked up without trouble that presents the appearance of being detached from a body, and whose clearly defined edges give an idea that the main deposit is not far distant. Such is the openness of the limestone that the miner on dropping a stone into a crevice could distinctly hear the soundings for some time, leading him to think that where such ore and open limestone existed, together with the ocular proofs, he must find a resting place.

As regards the coal, when burning or being subjected to the blow of the heat and brightness are great, owing in a measure to its comparative freedom from that injurious element sulphur. The impurity is considerable, and local consumption will be great. Limestone burning is carried on to a slight extent, and no better could be produced or wished for.

Again is the absence of railway accommodation much regretted as the advances and observes the celebrated building stones of Falls Road, that would, if carriage were less, embellish and beautify our shores, and reflect credit on the Cumberland hills. Further, and entering more into the clay-slate formation, come the Caldbeck and Market ranges, where some considerable speculations have been entered into, but on account of the distant rail and consequent weight and expensive cartage, together with clumsy and unfair management, many most promising lodes have been worked only to a slight extent, and thrown in, giving the idea of a barren and unproductive country as regards mineral deposits, and many more have been left to pick up into them. One celebrated company of gentlemen, and of much enterprise and courage have worked without profit, and the results that might surely have been reversed had only judgment, industry, and economy been exercised, though the great parent of mineral prosperity would be the nearer approach of a railway line. Many extensive sets have two, three, and even four distinct veins running through them; some few even more, and in two or three

instances five and seven distinct lodes may be clearly distinguished, of lead, copper, and many, manganese, cobalt, barytes, sulphur, ochres, &c. The whole country from Measgate presents the most encouraging and favourable hopes of a paying line, and if any company would thoroughly and carefully examine the district they could not but be impressed with sanguine expectations. The cost of making would be comparatively slight; two-thirds being side-bank cutting, and common land—no rivers to cross, no great surface damage, while the requisite material is close at hand, with a well populated and wealthy country, productive of all that has hitherto made railway making remunerative to the promoters. The thickly inhabited villages, whose requirements are considerable, are distant from any market town, and there is difficulty in procuring coals, provisions, indeed, every household and agricultural necessity.

Wigton is about the nearest town, some 8 to 8½ miles from the majority of the villages, whose inhabitants find great difficulty in procuring every article on account of the limited facilities for travelling. Should any co-operative company or general store open the benefits to the proprietors would be great, and to the surrounding villages of Measgate (where recently pits of great and lasting coal raising capabilities have been opened, and I am informed on good authority that in a few months their united employment will number from three to four thousand hands), Ireby, Torpenhow, Bothel, Udale, Ruthwaite, and the surrounding farms (many of great extent), would gladly hail with thankfulness the advent of so great a boon.

W. W. B.

MINING IN THE SOUTH-WEST OF IRELAND.

Sir,—It seems unaccountable that capitalists make up their minds year after year to lose millions sterling in all sorts of foreign schemes over which they have no possible control, when they may safely invest their capital at home with the certainty of remunerative returns. There may be pleasure in the excitement caused by the promises held out of enormous profits to be derived from the investment of capital in foreign bonds, pretended securities, and all sorts of bubble schemes, but when the delusion is over, and the public discover how "dear they have paid for their whistle," it is amazing that they will allow themselves to be deceived and robbed over and over again. It is the opinion of some authorities that "copper mining in Cornwall is a thing of the past;" I beg, however, to dissent from this opinion, and am firmly persuaded that copper mining in Cornwall of the future will be as extensive and profitable as it was in the past.

There are also extensive and valuable fields for the safe investment of capital in copper mining in the South-West of Ireland. I speak from practical experience of nearly forty years in those districts, and I do not hesitate to say that if capital is invested in the copper and lead mines, &c., I could name, and am intimately acquainted with, and fairly and honestly applied to work them, they will yield good profits in a comparatively short time, as they have been worked up to a certain point, and stopped short of the prize for the want of a little more capital. The copper ore, generally speaking, in the South-West of Ireland is of a very superior quality, and contains from 5 to 40 ozs. of silver per ton of ore. I never saw any that gave less than 5 ozs. to the ton of ore. The ore, with few exceptions, is sold in Swansea for the value of the copper it contains, for if you stipulate to be paid for the silver also you must sell by private sale—not a very satisfactory arrangement. There are deposits of the green carbonate of copper which may be quarried open from surface, and when crushed dry gives from 2 to 3 per cent. of copper. I have also seen mudstone which contains 8 ozs. of silver per ton of ore, and in connection with it there is black oxide and yellow copper ore. Some of those lodes are 8 ft. wide, and run into a mountain 1000 ft. high above the sea level.

In another district, in the carboniferous limestone, there are fine lodes of silver-lead, blende, and arsenical pyrites, all containing silver, and near the junction of clay-slate and limestone; there are fine copper lodes, and I probably some of the most extensive old iron works in the United Kingdom. The mines, districts, &c., I have briefly referred to will not only, no doubt, yield large profits, but present a grand opportunity for a passing fortune, by the introduction of the most scientific inventions and appliances for the extraction of all the precious and other metals the ores contain. Here is a field, which may be reached in a few hours from any part of the kingdom, for sound legitimate commercial enterprise. Why will capitalists, therefore, go on losing their money by the million in foreign schemes when they may undoubtedly realise at home handsome profits upon the capital invested? It may be objected that numerous companies have been formed, and large amounts of capital subscribed in England for working Irish mines; this is true. But this ship was never yet built that could carry a tide of said capital across the Irish Channel, consequently it never reached this country. I fear I have trespassing too much on your valuable space, or I might say a few words about slate quarries, barytes mines, &c.

Cappagh Mine, Ballydehob, Co. Cork, Nov. 6. WM. THOMAS.

VIRGINIA TIN AND COPPER MINE (ASHBURTON).

Sir,—Capt. James Richards desires me to say that the central costean shaft is sunk 4 fms., and that they are saving the copper for dressing, the weather being dry is greatly in favour. They were driven out of the south shaft by the sudden influx of water just as they cut a similar vein or lode as the central, which caused him to try the central lode about 50 fms. apart. I mentioned many advantages before, which are always of great consequence, such as a large sett. One freeholder and his lordship being the lords of the manor will facilitate the welfare of the adventure, similar to the Duke of Bedford, the Devon Consols, and South Caradon, now amalgamated with West Caradon.

GEORGE SPARKE.

Nov. 9.

SUPPLIES TO MINES.

Sir,—It is but fair and natural that a shareholder in a mine should have precedence to a non-shareholder in supplying materials and goods, if he will supply on equal terms. I heard lately of a remarkable case of attempted imposition on a mining company by a dealer in iron, &c. This gentleman held a large interest in a tin-work, and without any order from the manager sent in a very large quantity of pumps, &c., for which he made a charge of 1700Z. The agent said "Who ordered you to send in all these things—which are not wanted?" "The engineer," was the reply. The engineer (since deceased) it is supposed was to have a quota of the profit on the supply of those things, so that he had an interest in supplying largely. The agent of the mine (Capt. T. Parkyn) was requested by the company, or by the purser, or committee, to estimate the value of the goods so supplied. He said that 600Z. was about a fair price for them. Afterwards it was mutually agreed to refer the question of value to arbitration, and the result was that 620Z. was set down as the sum to be paid—nearly 1100Z. less than the amount claimed! The merchant afterwards boasted that he had a good price. A man who acted so unrighteously deserved the poverty and misery which subsequently became his experience.

Nov. 7.

R. SYMONS.

CASTLE DINAS (LATE ROYALTON) MINE.

Sir,—I met to-day a gentleman who is intimately acquainted with this mine, and was a large shareholder in it.—1. He told me that I understated its value. The workings were open, on a stanniferous elvan course of several fathoms in width, in which the tin was contained in minute veins, or "strings," so numerous as to require the removal of all the contents to the stamps and dressing floors for the separation of the tin from the debris.—2. That by the expenditure of from 110Z. to 120Z. per month they returned about 5 tons of black tin monthly, which was sold at from 48Z. 10s. to 50Z. per ton, leaving a profit of nearly 150Z. per month.—3. That with an increase in depth was an increase in the quality of the stuff, which in the bottom yielded 25 lbs. of tin per ton.—4. That the work would pay at the present price of tin, and that the working ceased owing to the misdirection of Capt. Secombe, who succeeded Capt. Parkyn in the management. Capt. Secombe caused all the pillars which sustained the ground over the drifts which were made from the pit to be taken away, and thereupon an extensive superincumbent mass fell down, and buried the most valuable parts of the works.—5. That Captain

Parkyn, having been offered 100Z. to resume the management, declined the offer. Owing to Capt. Secombe's error, and the consequences, the Duchy authorities threatened to revoke the lease.—6. That a fresh lease having been offered by the Duchy agents to Captain Parkyn, he is about to accept the same, and to re-work the property.

I am always ready to acknowledge and to correct any erroneous description I may make in my communications to the Journal concerning mines or any other thing, therefore it is that I trouble you with this note. I know you are good enough to open your columns for explanations.—*Truro, Nov. 7.*

R. SYMONS.

P.S.—I should observe that my informant, upon finding that Capt. Parkyn was superseded from the control of the works, immediately sold all his shares.

WHEEL BASSET AS A PROFITABLE INVESTMENT.

Sir,—If encouragement were wanting to push on to sink and drive, or an instance wanted to prove the short sightedness of adventurers who received dividends to the amount of 640Z. per share, this ill-used mine furnishes an example. Rich to an unusual degree—rich never to be poor had but energy and common sense directed the sinking of shafts and the opening of ground. The geological features favourable to the production of mineral cannot be excused. A counter-lode is producing large quantities of tin. The great lode, which produced to the west in South Wheal Frances their riches, has been intersected at the 115 fm. level, worth 10Z. per fathom, and is being driven at 2Z. 10s. and 2Z. per fathom, or at a profit of 16s. in 1Z. Over this 115 a good and productive lode has been opened for 70 fms. in length; 8 fms. of ground have been opened in the 115, producing from 1½ to 2 tons of tin at an expense of 20Z. in a fortnight. Of the appearance of this lode for 7 ft. wide, no one who has not seen it can form an opinion—a rich gossan, carrying a flock of rich tin on the hanging wall, while the footwall is a strong and burnt up gossan, warranting one to hold the faith that Basset, rich as it has been, has richer days in store. Four or five years of time have been lost, necessitating an outlay of many thousands of pounds through the mine running to the bottom. This has now been overcome, and Carnie shaft sunk to the 11, to be resumed next week in a channelf of ground to be mined for comparative ease, and the very colour and character miners so much desire, and which lead to prophecies of riches.

The new copper lode, recently intersected at the 75, is opening up profitable ground. The intersection of this lode at the 60, from Steven's shaft, is looked forward to with great interest, as parallel to this point of intersection North Basset made immense profits. It may be recollected that after North Basset ceased working all the ground through which the valuable lodes passed was added to Wheal Basset, so that the sett is very extensive, the two mines together having yielded nearly 1,000,000Z. in profits. Greater riches rest below to give employment to generations now in infancy. A greater mine than Dolcoath is here before the 320 is reached if prosecuted with vigour by men like Capt. Travena, whose whole soul is in his work, and who is a large shareholder, thus giving proof of his faith in the old mine being again a great prize at an early day.

47, Threadneedle-street, Nov. 8.

H. WADDINGTON.

PROSPECTS OF CORNISH MINING.

Sir,—The present is most assuredly a good time for persons who desire to invest to make enquiries into the real state and prospects of the different mines, so as to make such selection as shall tend to their benefit, taking care to avoid those of a doubtful character. That we are on the eve of better times may be gathered from the fact of the progressive rise in minerals stimulated by an excessive demand caused by the general improvement in the world's market. The great demand for both copper and tin will cause parties to search for mines in unexplored ground, the cost of working which is not a tithe part of that of rescussitating old deep and worn out mines. Of late many mines after an outlay of some 10,000Z. or 12,000Z., being unable to stem over the tide of depression, have been obliged to succumb, whereas the spending of a further 2000Z. or 3000Z. the original object would be attained, and probably open up permanently productive mines. There are some properties of this description known to the writer where the whole can be bought for a few hundreds of pounds, while an additional expenditure of 2000Z. or 3000Z. at most, extending over a period of 12 months, would discover deposits of mineral equal in riches to any yet found. If parties in the time of depression, or as at present at the commencement of a reaction, have the heart to launch out in such properties it is scarcely possible to make a mistake. Fortunes are oftener missed through want of heart than through want of money.

Scorrier, Cornwall, Nov. 7.

CHAS. BAWDEN.

PROSPECTS IN THE GWENNAP DISTRICT.

Sir,—With the improved price of copper and tin comes a decided change over the market price of mining stock, and an enquiry by the capitalist as to what mine is best to invest his surplus cash. On several occasions I have, through the medium of your columns, referred to the new wrought ground remaining at an indistinct around the greatest mines ever known in England. No district in the kingdom for its extent has produced the amount of mineral and profits that the Gwennap district has, and there is no district that can show stronger proofs of equally large and productive deposits of mineral yet to be discovered. Some comparatively short time since parties had the heart and courage to lay out about 2000Z. in a piece of unwrought ground called West Pollice, which is situated in the very hot-bed of this great mining district, and known to mining authorities as containing large quantities of mineral, the result being (as everyone who knew the ground predicted) the laying open of a good mine. Although only now down to the 50 it has commenced to pay dividends, the last being 5s. per share, while the next, in all probability, will be 10s. per share, and still progressing to a permanently productive mine. Present market value about 40,000Z. There are others just about to commence active operations under similar circumstances, and with every prospect of equal success. This is the class of enterprise most likely to enrich the shareholder. It is to this class of mining we must look for Cornwall's future; and it is to this class of mining I invite the attention of the enterprising public. The present favourable opportunity should at once be embraced.

CHARLES BAWDEN.

Scorrier, Cornwall.

MINING IN CARDIGANSHIRE.

Sir,—In referring to the North Rheidol, late the Caegynon, Mine in my last letter, which appeared in the Journal of Oct. 28, I mentioned about the water-course running into the mine from the River Rheidol, and which commences from the south side of the river near to the falls at the Devil's Bridge, and by means of strong launders the water is carried over the river and through different lands into the Caegynon Mine. Altogether the length of the water-course (or at least we would call it in mining terms) from beginning to end is no more than half-a-mile. It runs through the land of Tynffron for about 80 fathoms or less, for which an annual rent is paid to the tenant, also to the owner of Pwera and of Twedrhwi Sebon, and as long as these annual rents are paid so long shall they enjoy their good supply of water, of which they may be proud. As to the Tynffron Mine there is not, neither ever was there, a cut-water-leat belonging to it, for it has not been working—scarcely worth calling working—for the last 30 odd years, and it is possible it may never work again; although I have at all times and will still speak well of it as a mine worthy of a trial, yet from the first to the last I never had any machinery to call for water-courses, and the only thing it can boast of is the adit level. Now, Mr. Absalom Francis, in last week's Journal, comes down upon me like one whose authority and knowledge of all practical mining movements could not be for once denied; but the tale he tells you about this water-course, and of my having been misinformed, is simply unfounded. They cannot touch the water-course, and let me tell them through the medium of the Journal that so long as Tynffron is Tynffron they must beg and pray hard even themselves to get a drop of water from the great river which flows by their feet, for they must condescend to ask of the owners of the land through which the Caegynon leat runs before they can get sufficient water to turn the wheel of a barrow; and I am sorry that the Tynffron party should allow the trumpet to be blown by theory and not by practice. Mr. A. Francis also speaks of having the property of Caegynon in his own hands, through having the lease, &c., of the property of Mrs. Hughes, of Glanrhedol. May I ask our friend where Mr. Hughes was at the time he got Mrs. Hughes to grant the papers? Does he not remember that Mr. Hughes was a retired lawyer, and certainly he would look after his own business, and not trouble his delicate and elderly lady about leases; and where was the agent, so that the signature, at all events, would be that of the lord, not the wife. Again, if Mr. A. Francis ever had anything to do in the way of mining in the valley, surely he must remember that the water-course alluded to was made

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In constructing and arranging the mechanism for actuating the slide valves of direct-acting steam pumps Messrs. HARRY WHEELER, of Birmingham, and JOSEPH PEARSON, of Handsworth, both practical engine fitters, propose to form in the steam chest two small cylinders, their axis being in the same line and parallel to the axis of the steam cylinder. The cover ends of these small cylinders through which the piston rods pass are turned towards each other. The piston rods carry tappets at their ends, the said tappets being jointed to the said rods. The ends of these tappets when in their normal position are below the level of a projection on the slide valve, and as the said pistons advance their tappets bear against and carry forward the slide valve in one or other direction. From the outside of the steam chest screw stops pass into the said steam chest. Projections on the tappets strike against the said stops when the small pistons have advanced to a greater or less distance, and by lifting their ends disengage them from the slide valve. The precise point in the strokes of the small pistons at which the tappets are liberated from the slide valve is determined by the distance to which the screw stops are advanced. On the return motions of the pistons of the small cylinders the tappets are restored to their normal position by striking against the covers of the said small cylinders. Ports communicating between the steam cylinders and the said small cylinders admit steam from the former into the latter at the required times, and also effect the exhaust of the said small cylinders. The cover end of each small cylinder is in communication with the exhaust pipe of the steam cylinder. By the motion of the piston of the steam cylinder the said small cylinders are supplied with steam and exhausted at the required times for the proper working of the slide valve of the steam cylinder.

SEPARATING MINERALS BY AIR.

The improvements in machinery for crushing, sizing, and concentrating ores, invented by Mr. R. S. Krom, of New York, have been several times referred to in the Journal, and the arrangement having obtained the highest award at the Centennial Exhibition, the inventor has issued a new edition of his descriptive treatise upon his method. The object which Mr. Krom had in view and the results sought were—the production of machinery better adapted for the concentration of ores to supersede the wasteful and imperfect system of wet concentration, and machinery better adapted for the work of crushing and sizing. The introduction of any new system, however simple or good it may be, has always been attended with many obstacles, and the introduction of improved machinery, and the methods of crushing and concentrating ores, have proved no exception to the rule. No one has doubted the efficiency of Mr. Krom's crushing and screening machinery, but the dry system of concentration has been criticised; he, therefore, in the present edition seeks to show that the objections are groundless. The objection raised in the beginning to the dry system was that the ore would always have to be dry, which would in many cases add to the expense, and that the dust raised by dry concentration would prove objectionable. But it is becoming known that the advantages of dry crushing and sizing, coupled with a simple means of drying and removing the dust, remove all the objections; and, moreover, that wet crushing and sizing is practically impossible in view of the superior advantages offered in treating the same ore in a dry state. The dust complained of commences with the crushing and ends with the sizing, either in wet or dry concentration, as the dust from concentration is very slight; but the dust is removed from all parts of the mill as fast as made, and deposited in a settling chamber, and saved for subsequent treatment by means of an exhaust fan and pipes. Another question some have endeavoured to raise against the dry system is that water is theoretically the best medium, but Mr. Krom shows the fallacy of this opinion, and demonstrates both practically and theoretically that air is the best medium.

It has long been recognised by the more competent dressers that an ore to be concentrated must be granular instead of pulverised, and any system of crushing which diminishes the percentage of dust or shins to the minimum amount is the proper one to adopt. Ore from rollers crushed to pass 100 screen meshes to the square inch gives from 88 to 99 per cent. of granular atoms, and 10 to 12 per cent. of dust (which will pass through the screen). Ores from rollers crushed to pass a screen with 532-in. holes gives 92 per cent. of granular atoms and 8 per cent. of dust; and wet crushing under stamps through 532-in. holes gives 32 per cent. of sand and 68 per cent. of flour and dust on the average. The average loss of poor argilliferous ores in concentration by water is—with coarse sands, 40 per cent.; with middle fine, 35 per cent.; and with slimes, 60 to 70 per cent. It seems hardly necessary to explain the fact why rolls produce so small a percentage of dust in comparison with that from the stamp mill, since the reason is obvious. The jaw crusher and also the rolls, when properly applied, simply break up the ore, and all particles which are fine enough fall immediately away, receiving no further crushing, whereas in the use of the stamp mill the blows continue to fall on some portions after they are already too fine, simply because the manner in which the crushed particles escape from further blows is mostly accidental rather than positive. The stamps may fall repeatedly on the same particles after they are already fine enough, because the splashing which the fall of the stamp produces may not carry such at once through the screen. Aside from the fact that stamps are totally unfit for the purpose of preparing ore for concentration, it is doubtful whether their use is advisable under any circumstances, but Mr. Krom institutes a comparison in the matter of cost between the two systems of crushing, for wear and tear and for power consumed, in order that the question of economy shall be demonstrated and understood.

The actual wear and tear per ton of ore crushed having been given in the United States Commissioner Raymond's reports for 1873 and 1874. The cost of the metal destroyed in crushing a ton of ore with stamps is found to be 18 cents, and the cost of the metal destroyed in crushing a ton of similar ore rolls is found to be 24 cents. One set of roll tyres crushed over 23,000 tons of ore. The fallacy of the opinion that water is preferable to air as a separating medium is clearly shown. It is often asserted that water has a greater margin for separating ores than air, but practical results of dry concentration prove the reverse to be the case; experiments have also been recently instituted to demonstrate theoretically that in air we have the greatest margin for separation. To illustrate this theoretically Mr. Krom erected two glass tubes, each 2 in. diameter and 5 ft. high. One of these he filled with water, through the other he forced a regulated blast of air. He found that in water the rate of fall was, as others have estimated, equal with a 1-in. globe of galena and a 4-8th in. globe of quartz. But when the blast of air was regulated to retard the galena in falling to the same extent as the water, then the 4-8th globe of quartz was sustained by the blast of air, and did not fall, while the galena fell as rapidly as in the tube of water. He also employed bodies of other forms with practically the same results. Altogether, the theoretical results correspond exactly with those obtained in practice—that with less sizing better results can be obtained with air than can possibly be reached with water. He also shows that dry ore particles in the operation of separating slide by each other more freely—that is, with less friction than they do in water.

The sound practical knowledge displayed by Mr. Krom throughout the treatise leaves no doubt that he has given considerable attention to the subject, and the description and illustrations of his machinery cannot be read without leading to the conclusion that it approaches very closely to perfection. It is by attention to such matters as these that mining can be made remunerative, and there can be little question the decadence of home mining is largely attri-

butable to the indisposition of managers generally to avail themselves of discoveries and improvements which the experience of the more educated has suggested.

FOREIGN MINES.

ST. JOHN DEL REY.—Telegram from Morro Velho, dated Rio de Janeiro, Oct. 31: Produce 12 days, second division of October, 15,750 oits., 6102Z. Yield, 7-8 oits. per ton.

DON PEDRO.—Sept. 30: The ore extracted has been derived from No. 6 shoot, No. 4 slope. Very little has been taken from the No. 5 shoot since the 25th, in consequence of increase of water in the No. 2 slope. A little has been taken from the No. 2 slope in the canal, and from the pillar of ground in Alice's West, and from the No. 5 shoot above. General work for the last seven days is of a very poor quality.

Oct. 13.—The ores have been extracted from the canal No. 2 slope, No. 6 shoot, Nos. 4 and 5 slopes; and from the curve. General work has again improved a little.—Stopping: Canal No. 2 slope has again improved in quality, eight boxes of work have been taken from the southern part of this slope on the old vein. This vein is again becoming very large and well defined, but is of low quality hoxwork. No. 6 shoot: No. 4 slope being continued without change, on the 3rd we commenced the No. 5 slope, in back of the No. 6 shoot, level on the south line of gold. A general work from same is of a moderate quality.—No. 8 shoot: Nothing has been done since our last report, in consequence of increase of water in the No. 2 slope.—Curve: The works on this shoot being carried on very satisfactorily, and we hope to lay open a great quantity of stopping ground at this point. The pillars of ground in Alice's West are suspended, as it is necessary for the works above.—Drainage: The water is still rising in bottom of mine, in consequence of the increase of water in No. 2 slope in No. 8 shoot. Water now 6 ft. in 35 fathoms pit. Prospective and running work, continued as usual.—Explosions: No explosion in Mine: The drivings east and north at Alice's West being continued, on the 3rd we commenced an exploring rise in the entrance of Alice's West, to prove the north part of No. 6 shoot.

Telegram, Nov. 10: Discovery in the exploration above Alice's level improved.

RICHMOND CONSOLIDATED.—Telegram: Week's run, \$55,000.
—R. Rickard, Oct. 14: The shoot at the bottom of the mine in the 800 drift is completed. We shall now begin to stop from the winze at the same time the drift will be tended. We have risen 18 ft. in back of the 800, and the ore met with near the shaft, and the ore is of very good quality, with occasional stones of galena; the remainder is of low grade. The winze is sunk 9 ft. below this level in one of the same grade. Nothing met with in the 700 drift, extension still in limestone. The 600 drift is still in shale; we are now going to cross cut to intersect the winze sunk from the slope above. No. 2 winze sunk from the south east end of the High slope is down within 16 ft. of the 600 level, all the distance in good ore. The High slope is looking about the same as last reported. The west side of the hill is looking well; we have opened out a slope 12 ft. wide, and have drifted 30 ft. in ore; the part of the mine will, according to present appearance, turn out large quantities of ore, it being of higher grade in gold than ore from any part of the mine; it is advantageously mixed and worked with the rest, so as to obtain bullion of high assay in gold.

—R. Rickard, Oct. 21: We have resumed the drifting of the 800; the end is in limestone. The ore on the ore body met with near the shaft, in the 800, has very much improved; we have risen on it 30 ft., and the ore in the last 10 ft. is of good quality, but cannot yet tell the extent of the ore. The 700 drift is in soft red lime, very good and for working. The 600 drift is still in shale, and the end is now being worked. The winze sunk from the High slope, the winze sunk from the High chamber has been suspended from the bottom of the winze; a drift has been made 30 ft. in good ore, and sufficient work has been done here to demonstrate that there is a large bed of ore making down at this point. Nothing more will be done until the 600 drift has been communicated with this point. The 400 drift has been extended 185 ft. from the main drift, and the ground is now being surveyed to make connection with the High slope. There is no alteration in the stopes, all looking well. The workings on the west side of hill are about the same as last reported. The three ore furnaces and one hydrocylinder are in good working order. Out of the hydrocylinder is under repair, but will be in full work again in a few days.

ALMADA AND TIRITO.—Telegram from Mr. Breich: Width of Tirito lode under the 42 ft. level 3 feet; ley of ores unselected 100 oits. per ton. The ore is easily worked by amalgamation. Preparing to sink Tirito shaft.

BIRDSEYE CREEK (Gold).—G. S. Powers, Oct. 16: I have this day sent you the following cable:—We have cleaned up a run of 30 days—gross, \$10,000; profit, \$1000; remitted, \$1500. The 30 days was the time consumed in running, but were actually less than 15 twenty-four hours days washing. The last regular washing was Sept. 10, since which time we have used the force in cleaning the rock, and cut a good one last season. It will still be necessary to keep a considerable force employed in Neice claim during the remainder of this and the greater portion of next month in sinking rock cuts and running powder drifts, &c., that everything may be in readiness when fall rains set in. The work in Waloupa Tunnel is progressing rapidly. The contractors have something over 100 ft. completed to this date; the tunnel was commenced Sept. 20, making 4 ft. per day; on an average the force employed is nine men, or three shifts of eight hours each; the rock is not very favorable as yet, but I think the contractors will be able to carry it through at the agreed price—\$7 per foot.

BLUE TENT (Gold).—D. T. Hughes, Oct. 14: We had a shower of rain here this week which has helped us out with our water considerably, and we would have washed more time South Yuba had it not been for our cleaning up. Everything works favourable.

CEDAR CREEK (Gold).—T. B. Ludlum, Oct. 21: Since my last I have continued to drive ahead with the work as fast as circumstances would permit. I am pleased to report that we have reached the Bakershaft. The night shift to-night will finish the shaft, which was sunk some weeks since, and will be ready for work. We have immediately begun to construct the sluice. I have this day sent you a cablegram as follows:—"Baker shaft and tunnel connected." The incline from the shaft to the rim is finished and ready for work, and all work in the claim above is nearly completed. The early part of this week we were favoured with quite heavy showers of rain, which increased our water supply, so that we have had ample to run our machinery, and we have accumulated sufficient in our Alta reservoir to finish the work of sluicing out the sediment in the reservoir at the head of the large pipe, which was sunk some weeks since, and will be ready for work. We have continued to sink new pits, and have extended our engine-room to take new boiler, which is all set alongside the old one, and ready for steam.

I.X.L. (Gold and Silver).—Lewis Chalmers, Oct. 16: The north drift from the 200 ft. level is now in 24 ft., having driven 15 ft. last week. I had two men stopping in the lower tunnel, where it cut the lode and got out eight carloads of fair ore. Mr. Arnot is driving things at the mill. We shall have undoubtedly a very fine mill, and the indications in driving north are good for a rich strike.

CONDES OF CHILI.—Sept. 25: Leolina Mine: We have commenced breaking ore, and getting the same to surface as fast as the limited number of men at command will permit. The first lot of first-class ore has been taken, and a good crop loaded with a portion of the same has reached Santiago to day. Now that the annual celebration of the Independence of Chili is over I hope to have a good supply of men; during this celebration it is extremely difficult to get anyone to work. In making an examination of the surface when up at the mines on the 17th inst. I discovered the outcrop of a counter lode, about 30 metres from the main Isolina lode. It having a good appearance I put a man to work upon it, and before I left he opened it for 5 metres in length and 1/2 metre wide, and a fair average sample of this gave 24 marks, or 61 oits. of silver per ton, and 14 1/2 per cent. of lead; this I consider an important discovery, seeing that the deepest point reached in breaking the sample did not exceed 1/2 metre, and it is in virgin ground. This counter lode forms a junction with the Isolina lode going west; as soon as circumstances will permit I shall sink a shaft upon it. At the other mines the openings are choked with snow, therefore I have been unable to go into them, but I have every confidence from an inspection of the outcrop that when I get men to work them the result will be most satisfactory. I am more than ever convinced of the practicability of working all the year round, as when I was there on Monday snow fell for several hours, but did not obstruct the advance situation of the work; it did not remain long, excepting in the canchas (floors). We have, as already stated, commenced sending down ore, and I shall do my utmost to have 500 tons in Santiago by the end of next month, en route for England. At the smelting works I have taken out the bottom of the old reverberatory furnace, which I forward to England by this week's steamer, and am rebuilding it. As soon as done I hope the practical smelter will be here, and we shall commence operations in this department.

NEW ZEALAND KAPANGA (Gold).—J. Thomas, 8-pt. 23: Owing to the annual Government inspection of our boilers, and with forking the water after stopping for inspection and cleaning, caused a loss of the first week of this month, but doing anything in the bottom levels. During the past three weeks we have driven south in the No. 5 level 5 fms.; the lode is 2 ft. 6 in. wide, consisting of compact quartz, and carrying a leader of tough flouken on the footwall much mixed with fine black mudstone; the hanging wall is of the usual hard nature, regularity, and underlie. The lode-tuff broken whilst dressing was broken clean and sent to stamps shed, which should yield about 1 oit of gold per ton of stuff. The machinery and pitwork are in the best of order.

PESTARENA NITED.—The following are the returns from the Pestarena United Mines for October. From Val Topo district 12 oits. 2 dwts. 7/16 grs. gold, obtained from 514 metric tons, yield per ton 7 dwts. 7/16 grs. From Pestarena district 145 oits. 17 dwts. 2 grs. from 215 metric tons; yield per ton 13 dwts. 8/16 grs. Total from both districts 334 oits. 1 dwt., obtained from 732 metric tons of ore amalgamated.

PONTGIBAUD.—Nov. 1: Roure Mine: The sinking of the engine shaft below the 125 goes on pretty well, now down 21 metres. The 100 cross-cut east is in hard sparry ground. The 50 rise is within about 2 metres of hoing to the deep winze below the 20, which when accomplished will facilitate greatly the opening up of this part of the mine by enabling us to drive two or three levels into productive ground. The 30 metre level south is poor. The 60 metre level north is still being driven; a counter lode to open up some tribute ground lying between this and the 40 metre level ahead of this end. The winze in the bottom of the 60, a little before the 80 end south, yields 1/4 ton of ore per current metre. The winze in the bottom of the 20, south from mill shaft, over the 40 slope, yields 1/4 ton of ore per metre. This adit north, on Virginie's lode, yields also 1/4 ton per current metre. Our tribute pitches and stopes throughout the mine maintain their ordinary yield.—Miche: The adit level north is unproductive. The intermediate level, in the same direction, is in a large, soft, disordered lode, also unproductive. The same level south has opened a little tribute ground during the month. The pitch in the back of this level yields 1/4 ton of ore per superficial metre.—La Brousse: The 140 metre level, south from Bassac's shaft, yields 1/4 ton of ore per current metre, and the 120 south 1/4 ton. The undercutting of the lode behind the 100 end yields good ore, worth 1/4 ton per fathom. The 100 south is unproductive. The 80 south continues in kindly rock, but yet unproductive. The sinking of the air shaft below the 80 goes on favourably. The three cross-cuts towards the site of the new shaft at the 120, 80, and adit levels are all in favourable ground. The stopes and tribute pitches throughout the mine maintain their usual yield.—Prad: The sinking of St. George's shaft below the 90 metre level goes on well. The rise in the 90 north yields 1/4 ton of ore per current metre. The 90 south, on the soft part of the lode, yields a little saving work. The winze in the bottom of the 70,

just ahead of this end, opens tribute ground. The 70, north of St. George's, yields 1/4 ton of ore per metre. The same level, south of cross-cut, yields 1/4 ton per metre. The 50 south yields about 1/4 ton, and the 50 north 1/4 ton of ore per metre. The stopes and pitches are of about the same value as last month. At surface our dressing during the past month has gone on regularly, and the samplings have amounted to 297 tons.

[For remainder of Foreign Mines see to-day's Journal.]

EXCHEQUER AND I.X.L. MINES.—The Exchequer saw-mill is working night and day, getting out lumber for these mines and for the I.X.L. mill. The Huntington shingle mill is about ready to commence work. A planing, moulding, tonguing, and grooving machine is on route from the Vulcan Ironworks, San Francisco, for this mill. In a few days the saws and other machinery, connected with the engine. In the Exchequer Mine good ore continues to be cut out, and the mine never looked better. On Wednesday last, in the 400 ft. level, furnace is ready for work, and is only waiting for the additional battery to be placed in position, which work is going on as fast as possible. Good ore is being taken from the upper tunnel in the I.X.L. Mine. In the 200 ft. level they are running in the casing of the lode to the ore shoot from which the rich ore was taken in 1865, and it is expected that 120 ft. more will reach it. Upwards of 200 men are employed at the Exchequer and I.X.L. Mines, mills, and wood camps.—*Alpine Chronicle*, Oct. 14.

Registration of New Companies.

The following joint-stock companies have been duly registered:—**PLYNIMMON LEAD MINING COMPANY (Limited).**—Capital 24,000Z, in 24,000 shares. To purchase the leasehold property and mines of the Plynimmon Mining Company (Limited), together with the plant and machinery, &c. The subscribers (who take one share each) are—E. W. Wingrove, Southsea, Hants; Twickenham, no occupation; S. W. Dawkes, 7, Whitehall-place; Samuel York, Shiffall, Salop, merchant; R. P. D. Monypenny, barrister-at-law; J. H. Murdoch, 8, Austinfriars, mining engineer; Alexander Kerly, 14, Great Winchester-street, solicitor; G. H. Smith, Stoke Newington-road, accountant. The directors are—E. W. Wingrove, S. W. Dawkes, and R. P. D. Monypenny, the qualification being the holding of 100 shares. The remuneration is 50Z. per annum, for each director, with an additional 50Z. upon payment of a 10 per cent. dividend.

RED ROCK LEAD MINING COMPANY (Limited).—Capital 20,000Z, in 20,000 shares. To acquire the Graiggoch Lead Mine, in the county of Cardigan, together with the plant, &c. The subscribers (who take one share each) are—H. Verdon, 14, Great Winchester-street, secretary; J. Hansford, 89, Geneva-road, Brixton, no occupation; Alexander Kerly, 14, Great Winchester-street, solicitor; G. Bedford, Rouse Tree House, Tulse-hill, colliery proprietor; H. Walford, Clange-alley, stockbroker; H. Moore, 10, Lambeth, Collyer Heath, secretary; John Darrah, Viageiro-road, Leyton, accountant. The directors are Messrs. W. B. Cooke, J. P. G. Carlyn-Simmons, and T. B. Tippetts, the qualification being the holding of 100 shares. The remuneration is to be 80Z. per annum for each director until a 10 per cent. dividend be paid, when it will be slightly increased.

DUNRAVEN ADARE COLLIERIES (Limited).—Capital 20,000Z, in 100,000 shares. To acquire and work certain collieries in Glamorganshire. The subscribers (who take 175 shares each) are—George Shaw, Brownlie, Sheffield, colliery proprietor; John W. Wing, Sheffield, public accountant; John Easterbrook, Meadow House in Sheffield, gentleman; Thomas Rhodes Birk, Stone Grange, Sheffield, wholesale grocer; John Hibbard, Lamb hill, Handsworth, manufacturer; James Harris, Moorgate, Rotherham, ironfounder. The first directors will be Messrs. George Shaw, John Easterbrook, and T. B. Birks, the qualification being the holding of 25 shares. Up to the time of holding the first ordinary general meeting Mr. Shaw, as managing director and chairman, will receive 150Z., and the other directors 25Z. After that date the annual remuneration will be fixed. The office of the company will be at Glen Neath, Glamorganshire.

YENGARIE SUGAR COMPANY (Limited).—Capital 100,000Z, in 100,000 shares. To acquire certain patents from Mr. Robert Tooth respecting the manufacture and treatment of sugar. The subscribers are—Charles Garnett, J. P., Blackhill House, Tamworth, 147; Robert Garnett, Bowhill Lodge, Tamworth, 175; Alfred Muir, 3, Woodlands terrace, Higher Boughton, Manchester, 150; H. Garnett, Bonhill House, Tamworth, 1; John Garnett, Bonhill House, Tamworth, 1; W. H. Honeyball, 52, Ashbury-road.

LANCASHIRE DYES COMPANY (Limited).—Capital 50,000Z, in 100,000 shares. To acquire letters patent for improvements in the production of dyestuffs and colouring matters, &c. The subscribers are—Thomas Wall, 27, Walgrave, Wigton, 100; C. H. Fairclough, Wigton and Southport, 100; W. A. Byron, 31, King-street, Wigton, 50; W. J. Saul, Wigton, 100; J. Smith, Douglas Bank, Wigton, 100; A. C. Jackson, Longhurst, near Wigton, 50; J. H. Johnson, 64, Albert-road, Southport, 100.

MOSSLEY LAND AND BUILDING COMPANY (Limited).—Capital 24,000Z, in 120,000 shares. The subscribers (who reside at Mossley, and take one share each) are—James Kenworthy, J. Dyson, G. H. Batley, G. M. Quirk, J. Robinson, and E. Marland.

LONDON FLOUR AND GRAIN COMPANY (Limited).—Capital 13,000Z, in 13,000 shares.

BRUNTCLEFFE HILL COLLIERY COMPANY (Limited).—Capital 2000Z, in 500 shares. To adopt and carry into effect an agreement for the purchase of beds and mines of coal in the West Riding of York. The subscribers (who take one share each) are—William Parkinson, Batley, Yorkshire, miner; Martin Ovedon, Rothwell, High, miner; B. T. Butler, Batley, ironmaster; Jesse Farrar, Batley, mason; Jesse Farrar, Batley, mason; James Gledhill, Batley, mason; Frederick Farrar, Batley, mason. The directors to be appointed at extraordinary meeting.

NEW BENSBURG MINING COMPANY (Limited).—Capital 22,500Z, in 4500 shares of 5Z. each, of which 1088 are A shares. To adopt and carry into effect an agreement made between Lawrence Richardson Bally, of Liverpool, of the one part, and James Thompson, of Liverpool, on behalf of the company, for the acquisition of certain mines, known as the Gairn, in the Gairn, in the county of Cumberland, now in the possession of the Bensburg Lead Mining and Smelting Company (Limited). The subscribers (who take one share each) are—Walter Eckenly, 1, Rumford place, Liverpool, produce broker; J. B. Williamson, Liverpool, colliery agent; W. G. Minzias, 18, Brunswick-street, Liverpool, merchant; James Nacarrow, Derby House, Rockferry, merchant; Charles Wells, 2, India Buildings, Liverpool, metal factor; George Large, 5, Tower Buildings, Liverpool, merchant; H. Wilson, 17, Water-street, Liverpool, steamship agent. The directors are to be not less than three or more than eight. The qualification is fixed at 50 shares.

SAINT HELEN'S COLLIERY AND BRICKWORKS COMPANY (Limited).—Capital 62,000Z, in 100,000 shares. To carry into effect an agreement for acquiring the leases of certain mining properties and brickfields in the county of Cumberland, known as the St. Helen's Colliery and Brickworks. The subscribers (who take one share each) are—William Mulcaster, sen., Hayter, Maryport, colliery proprietor; Richard Senhouse, Cockermouth, gentleman; H. Bell, Cockermouth, surgeon; J. W. Nicholson, Harrington, Cumberland, gentleman; William Mulcaster, jun., Aspatria, Cumberland, colliery agent; Walter Garth, 11, Lismore-terrace, Carlisle, accountant; James Footen, Maryport, accountant.

STAR FIRE INSURANCE COMPANY (Limited).—Capital 150,000Z, in 150,000 shares. To transact the general business of a fire insurance company, and to accept marine risks, &c. The subscribers are—Joseph Bethell Hallinack, Preston, 20; George Hamlet, Over, Cheshire, 20; Robert Poole, 6, Regent-street, Preston, 20; J. Gray White, 67, Bridgewater-street, Liverpool, 20; W. Thompson, Newton Avenue, Longlight, 20; J. A. Young, Cross-street, Manchester, 5; G. Arncliffe, 5, Warren-street, Stockport, 1.

FOREST COTTON SPINNING AND MANUFACTURING COMPANY (Limited).—Capital 30,000Z, in 30,000 shares. To acquire the Forest Cotton Mill at Water Netherchurch, Lancashire. The subscribers are—John Metcalfe, Tongbridge, Bump, 5; L. Ashworth, Rawtenstall, 5; S. Turner, Stock-street, John Pickup, Water Newchurch, 5; Richard Ashworth, Water Newchurch, 5; John Walker, Broad-clough, Bump, 5.

BESCOIT AND ALDRIDGE PATENT BRICK AND TILE COMPANY (Limited).—Capital 30,000Z, in 100,000 shares. To acquire the Bescoit Brickworks and the Aldridge Brick and Tile Works, Staffordshire. The subscribers are—Joseph Hart, Chesapeake House, Handsworth, 25; Richard Bescoit, Handsworth-road, Birmingham, 10; Arthur Wade, 24, Waterloo-street, Birmingham, 50; J. H. Powell, Birmingham, 10; John Bennett, Birmingham, 10; R. Marriott, Acoc's-green, 25; R. F. Allen, Brighton villas, Birmingham, 25.

GREAT WESTERN RAILWAY OFFICIALS.—The excellence to which high art engraving is now carried has just received another illustration in an engraved group containing the portraits of Mr. Grieson, the general manager, Mr. M. Beasley, the deputy manager, and 30 other gentlemen, heads of the sub-traffic department of the Great Western Railway. The portraits in each case are executed with remarkable fidelity, and the work, which has been carried out at a cost of about 1000Z., by Messrs. W. H. Baynon and Co., of Cheltenham, portrait engravers to the Queen, will prove of interest to all gentlemen connected with the railway world.

LADY BROKERS.—Writers on America have often testified to the rage for mining speculation among the community of San Francisco. Everybody there has his share in the profits of a mine, real or imaginary; even the little boys are popularly supposed to swap scrip instead of marbles and tops. The women are only less active in this kind of enterprise than the men; and they have lately formed a brokers' association confined exclusively to members of their own sex. The association is said to have an eminently practical aim, and to be in no way connected in principle with those better known organizations for the "emancipation" of the sex. It will extend its operations to all financial concerns, though its chief business will be the buying and selling of mining stock. The "directors" are said to be among the best known female speculators in California. One of their principal objects is to supply information as to the state of the market that will place their fair customers on precisely the same level of advantage as dealers of the other sex. "A rough estimate (says a San Francisco paper), puts the number of women operators up in the thousands." It will soon be not only for the women but all by the women in the United States. It is to be hoped that the ladies of San Francisco may not be tempted to practise those devices for the control of the market invented by the Erie jobbers of New York. It will be a sad day for all of us when the "ring" that is popularly supposed to be the bound of feminine ambition shall no longer consist solely of the token received at the altar.

FOREIGN MINING AND METALLURGY.

The Belgian iron trade has exhibited comparatively little animation—in fact, business is only sustained with the help of considerable energy. Some works have made efforts of late to assure themselves work for the winter, and they have succeeded in doing so. Other establishments have work on hand which will occupy them for one or two months; the rates at which they have obtained orders are not very remunerative, but it is, of course, something to have assured subsistence to their workpeople. A syndicate has been formed among the proprietors of Belgian rolling-mills, with a view to an extension of outlets for their products. The exports of rails from Belgium have been rather decreasing of late, while those of other descriptions of worked iron have been somewhat increasing.

The general tone of the Belgian coal trade has not varied materially during the past week. Deliveries by railway of domestic quantities of coal have been well sustained, but the number of cargoes dispatched by water has been rather less; freights have fallen accordingly, although the number of boats without cargoes is comparatively small. There has not been a very active demand upon the Belgian markets for coal for industrial purposes; the orders received from glassworks have shown a little more activity, but prices have not been advanced, as had been reported in some quarters, the increase in the demand not having been sufficiently considerable to bring with it any enhancement of quotations. There will, it is expected, be a considerable deficit in the production of beetroot sugar in France and Belgium this year, the crop of beet being scanty and feeble as regards its saccharine richness. In seasons more propitious to the beetroot sugar interest manufacturers have had to lay in supplementary supplies of coal with which to finish off the season, but so far from this being the case this year some of them now find themselves under the necessity of cancelling contracts which they had concluded, at any rate in part. The reductions which are thus being made are said to amount in some cases to one-fifth the quantities originally ordered.

The Firms Forges and Steel Works Company has just held its annual meeting for 1875-76. The profits of the year were returned at 27,362l., including 1729l. deducted from the contingency fund. From the balance of 27,362l., 22,038l. was, however, devoted to sundry redemptions of plant, so that the net profits for the past financial year did not exceed 5324l. With the aid of a deduction of 4843l. from the special reserve fund the Council of Administration was enabled to recommend a dividend for 1875-76 at the rate of 1l. 8s. per share.

The Franco-Austrian Railway Company reports that it suffered last year in its mines and ironworks department from the general dullness and depression of the times. The total production effected at the company's collieries, nevertheless, amounted last year to 726,912 tons, or very nearly equal to the total attained in 1874. The lower sale prices obtained in 1875 rather seriously reduced the profits realised for the year. At Kladin the Tubon pit, which has been in course of sinking for several years past, struck a bed of coal in May, 1875, and the extraction of coal from this bed has been recently commenced. At Steyerdorf the company is deepening the Anina pit, which is expected to exert an important influence upon the future of the basin. The construction of a line from Temesvar to Orsova has induced the company to purchase the Armories Lignite Mines for 7645l. The total production at the company's ironstone mines last year was 63,495 tons, of which 51,982 tons were delivered to the Rasca, Dognascka, Bogsau, and Anina blast-furnaces.

THE NEW ZEALAND KAPANGA GOLD MINE.

The attention which has recently been drawn to this great mining property since the lode has been reached has induced us to seek information as to the history and prospects of that undertaking. As the result of our enquiries we have obtained the following particulars. We would, however, first of all remark that probably in no country in the world has so large an amount of gold been produced in so short a space of time as has been produced in New Zealand. Before 1857 no gold mine had been worked in that colony, but during the limited period of 19 years which have since elapsed the known export of gold from thence, according to official Government returns, has been no less than 8,038,571 ozs., of the value of 31,215,300l. sterling, as appears by the last official report prepared in pursuance of the order of the House of Representatives of New Zealand. One of the richest gold-bearing districts is that of Coromandel, in the Northern Island, not far from Auckland, and it is in that district that the Kapanga Mine is situated. Some years ago the mine was worked to a comparatively small extent, and in a very primitive manner, by some prospectors who had come over from Australia. In a very short period they raised ore to the value of 88,000l., and proved the existence of a lode of great richness and extent, but owing to the impossibility of procuring efficient machinery on the spot they could not contend against the water, and the mine became flooded.

Being unable to obtain proper machinery from Europe so as to enable them to continue work at the Kapanga Mine, which would have involved an outlay of 30,000l., and a delay of two or three years, they were attracted to neighbouring gold fields, where they could carry on operations with the rude appliances and machinery then alone available in the colony, at an immediate profit. But the wonderful result of their imperfect operations at Kapanga obtained more than a local repute; New Zealand gold mining was beginning to attract attention in England, and the fame of Kapanga pointed out that mine as the one upon which the employment of English capital would be likely to produce the most profitable results. Reports of the great auriferous value of the property were obtained from the most competent mining managers of the district, including Capt. J. Thomas, the present able manager of the company, Capt. W. Rowe, the manager of the now famous Caledonian Mine, Capt. J. Reeve, manager of the Imperial Crown Mine, besides many other engineers of eminence and local knowledge, and acting upon their advice a limited liability company was formed in this country to acquire and work the mine, under the title of the New Zealand Kapanga Gold Mining Company (Limited), with a capital of 100,000l., in 5l. shares, which were rapidly subscribed and fully paid-up, and it is worthy of remark that this is the only New Zealand mining company which has an official quotation on the London Stock Exchange. The position of the mine is peculiarly favourable. It is situated close to a shipping port, and has abundance of water for all purposes at all times, there is an unlimited supply of timber and coal at command and at cheap rates, the climate is proverbially salubrious, and provisions of all kinds are plentiful and cheap. Another important advantage possessed by mines in our own English colonies is that they are under proper protection, and as the Crown is the lessor direct supervision is exercised with a view to the due collection of the royalties, and this acts also as an efficient control upon the produce being duly accounted for, and also on the intelligence published from time to time as to the progress of the mines.

The Kapanga Company commenced operations more than four years ago under the management of Capt. James Thomas. Contracts were made with Messrs. Harvey and Co., of Hayle, Cornwall, to supply first-class machinery for pumping, winding, crushing, and amalgamating; capable of putting down the shaft to any depth that may be found necessary, with a powerful battery of stamps (50 heads) revolving, falling 70 times per minute, and with all the latest improvements. A new shaft was commenced in order to sink to the 50, but the formation was found to be of so adamantine a character that it was not until last year that the desired depth was reached. A cross-cut was then commenced east in order to cut the lode which had been proved by the old workings. The Government Warden or Mine Inspector of Coromandel district, in his annual report in April of this year to the Government Secretary of the Gold Fields, testifies in the following terms:—"I have already reported the excellence of the whole arrangements of the Kapanga Gold Mine. Everything done is well done, and with a regard for the permanence of the work, and the character of the reef they are seeking is well-known in the old workings to be extremely rich, it is confidently expected that the company will soon possess a mine giving steady yields." In the

same report the Warden stated that he deemed the finding of the Kapanga gold reef of such public importance that if it were reached within a reasonable time he would issue a special supplementary report announcing it, and accordingly on July 10 last he telegraphed to his Government as follows:—"Kapanga Mine. This company struck the old Kapanga reef on the 6th inst., 300 ft. from surface, after driving 420 ft. from the bottom of the shaft. Reef cut just below the old workings. Some rich gold specimens were obtained from the first contact with the reef. The reef is about 4 to 5 ft. thick, about north and south, with an average dip of 45°, and cut about the sea level."

On August 26 Capt. Thomas wrote as follows:—"From driving south I have obtained 204 ozs. of very rich specimens, which I estimate will produce 24 ozs. 10 dwts. of gold, also about 540 ozs. of quartz from the lode, estimated to yield 11 ozs. 16 dwts., with some 20 tons of general lodestuff for crushing, which I calculate will produce about 1 oz. of gold to the ton, showing an estimated yield when crushed of about 56 ozs. 6 dwts. of gold for 20 tons of quartz. The lode in each end is very regular, having an average underlie of 45° west, the hanging-wall is smooth and regular; it is exceedingly hard, being the elvan rock of this country. The footwall is a stiff blue killas-like stone, very good for driving on. I have sent you, via Melbourne, a box of magnificent gold quartz specimens, and an ingot of melted gold—estimated value, 161l. 17s. 5d."

Thus, after more than four years of arduous labour and perseverance the shareholders are about to be rewarded for their patience and for the confidence they have shown in the undertaking, the value of the gold-bearing quartz already proved is considerably above the average of even New Zealand gold mines, and besides the lode now being worked upon, several other lodes believed to be equally valuable are known to exist on the property, and we see no reason why the Kapanga Gold Mine should not equal the neighbouring Caledonian Mine, which in the short space of three months paid 208,780l. in dividends, and which in the six months from February to August, 1871, actually paid to the shareholders no less a sum than 454,740l., after placing large sums to "reserve."

The geological formation of the gold-bearing ground at the Kapanga exactly resembles that at the Caledonian, and we are informed that Capt. Thomas, who is well acquainted with the Caledonian Mine, declares he would not exchange Kapanga for it, notwithstanding that the Caledonian shares of 4l. each have reached so high a figure as over 500l. per share. We trust for the sake of those interested in this property that Capt. Thomas's views may be to the fullest extent realised. As a mine it has everything in its favour, the capital is very small, and with the machinery erected, and in full work, the shareholders may hope to see remittances commence with the new year.

We append a graphic account of the mine, which appeared in the New Zealand Daily Southern Cross of Aug. 7 last—

COROMANDEL KAPANGA MINE.—This mine, which the public have looked forward to with the greatest hopes for a long time past, and with which the mining interest of this province to a considerable extent by the probable introduction of English capital, should success be assured, deserves more than a passing notice. Upon visiting the ground on Wednesday last I was indebted to the courtesy of Capt. Thomas, the manager of the company's works, and Capt. Andrews for the opportunity of making this report, although it will necessarily be brief, as a description of the gigantic works which have been carried out for the last four years would occupy more space than you could possibly give. Although I was prepared for works on a most substantial basis, I had no conception of the magnitude of the works until descending the shaft with the manager, who pointed out to every landing what had been accomplished by modern improvements, among these being the great enacting of the mine to be opened north and south. Upon reaching the bottom of the shaft I passed into a capacious chamber, cut out by the manager before entering on the cross-cut. In the chamber a ladder was come upon, and followed from the mouth of the drive a distance of 250 ft. The manager pursued this course so as to enable him to get on with the work, knowing full well that when a ladder is in hand the country will necessarily be much softer, hence a little deviation from the original course occurred. At last, however, the ladder was obliged to be left, as it was dipping out of the direction the manager wished to go in order to reach the Kapanga lode. The moment he was compelled to adopt this course the country became like adamant, and for months, with well tried zeal, and nearly worn out, he continued the even tenor of his way, in the face of misrepresentation by the local Press, and the sneers of those who stated he was going the wrong way, and the result justified his foresight and patience. Upon reaching the lode, after having driven 450 ft., he found that he had come upon the old winze within a foot or so of the point he had indicated, and gold in most payable quantities was staring him in the face, the lode being from 3 to 4 ft. wide. Upon intersecting the lode, it was, of course, cut through, and at once a chamber was started with the view of enabling the mine to be opened north and south. Upon the chamber being finished the drive north was continued until solid ground was come upon some few feet from the winze, and the ladder in the face, although rather smaller, was looking very well. Upon rising to the old No. 4 level, and ascending the winze, I found the timbers generally were in splendid condition, and I also found—that was much less to the taste—a sea of mud, hence I took the manager's word for all the work that had been done, instead of exploring. In the north the drive in No. 4 level has been extended 200 or 300 ft., and on the south side a great deal of ground has been stopped out, showing that a number of shoots of gold have been worked out in this distance. The lode in the whole mine seems to strike north and south, and is underlying 45° west. There is a number of auriferous stringers traversing the ground also, which will occupy the manager's time at some future day; at the present his attention is concentrated upon the Kapanga lode. Since my visit the south portion of the mine is opened out, and last night very rich specimens were obtained, and good prospects were left in the face of the lode. In the paddock there are some 30 tons of quartz, in which gold can be seen freely in the large blocks, and the crushing of this quartz will be shortly started. It will take a month or two before this mine can be thoroughly opened up and got into full swing, but the prospects are so good that the shareholders may look forward to a lasting prosperity, and that is the wish of every person in Coromandel.

MINERAL RESOURCES OF BUENOS AYRES.

During the unsparing attacks which were made some months ago by European Press writers against the credit of this Republic, it is singular that all reference to the mineral resources of the country should have been omitted by those who struck back in her defence; and yet in that direction must we look now for one of the surest and readiest means of replenishing an exhausted treasury, and giving a fresh impulse to our flagging commerce. The vastness of these resources is but imperfectly known even here, as well as very indifferently appreciated by the better informed few who either want the means or the energy to strive for practical results.

Argentine mine owners, as a rule, are not capitalists except to a very limited extent; hence nearly all their operations are carried on without proper appliances, and only in accordance with the most primitive systems. In passing through the mining districts one meets everywhere mines abandoned at the very moment when the labour and outlay expended on them were beginning to yield a liberal compensation, simply because the owners' means were low, or because the workings had gradually filled with water which his small staff of untrained peons could not keep under. Latterly some advances have been made towards a more improved system of mining, as is exemplified in the establishments of Treloar, in San Juan, and Don Antonio Fraguero, in Cordoba; but these isolated efforts only show in a still stronger light how much more could be done if more general attention were devoted to this important industry.

One would have expected, from the impression made on the public mind by the appearance in 1870 of Major Rickard's work on the mineral and other resources of the Argentine Republic, that the Government of that period, and equally its successor, would have strained every nerve to encourage the immigration of a European mining population into the country. Beyond the establishment of schools of mines, which consumed a useless money which would have been far better employed in bringing out skilled miners from England or Germany, its protection has been dispensed into less eligible channels, and the subject has only been kept alive by an occasional report, such as the able pamphlet of Prof. Kyle, of the National College in this city, and a newspaper article now and then. The mining population of the Confederation, despite of all drawbacks, is by no means insignificant, being 53½ per 1000, and the aggregate capital invested has been set down at rather above 200,000l. sterling. The annual production, according to the latest estimates within our reach, amounts to about 4000 ozs. of gold, 450,000 ozs. of silver, about 800 tons of copper, and about 1176 tons of lead, giving a sterling value, excluding lead, of about 133,000l. With suitable machinery, skilled labour, and cheap money these returns we may fairly assume would be more than doubled.

Unlike most other mineral producing countries, the Argentine Confederation is rich in nearly every kind of metal—gold, silver, copper, lead, nickel, iron, tin, aluminium, cobalt, &c. Petroleum springs and coal beds of good quality and large extent also exist; but from the same causes, scarcity of labour and capital, they only supply a local demand which will not compensate for working out. When the law establishing a national mint was sanctioned by Congress, it was believed that Government would either become owner of mines from which it could obtain supplies for mintage purposes, or else contract with mine owners on terms which, while advantageous to itself, would greatly stimulate mining enterprise throughout the country. The mint, however, is still in the womb of time. Had it been established the Government might coin all the money it required, and the issue of paper equivalents would have become a measure against which there could be no reasonable objection. If our Government, provincial and national, were owners of mines as they are owners of lands, they could become in the main self-supporting independently of imports and customs receipts, which are apt to run ruinously low, as is happening at this particular moment. Taking Peru by way of illustration, we find that as owner of its valuable guano deposits, it derived there-

from, in the 15 years from 1841 to 1856, a net gain of \$39,254,647; or as nearly as possible 7,850,927l. sterling. But our Governments instead of working out remunerative enterprises on their own account grant concessions, and rather than earn what should support, or go towards supporting them, depend on the commercial body which, under an ever increasing atlas of taxation, cannot long help them.

When political factions are more at rest and life and property are better secured, it will require little effort on the part of Government to attract a hard working, well skilled, mining population, under whose willing hands a new source of wealth will be opened up and the financial soundness of the country ensured.—Buenos Ayres Herald.

THE ANZIN COLLIERY.—We published last week the announcement of the sale of some shares of the New River Company, and also two original King's shares. This inspired us with the curiosity to ascertain whether other countries had not similar first-class stocks, and we find that the shares nearest approaching them are those of the Anzin Colliery, in the department of the Nord, France. These mines were worked for the first time in 1716 by Jacques Viscount Disandrouin, Taffin, and others, who had obtained the concession; but the best coal seam, called Maréchale, was only found in 1734. After many tribulations, in which the undertaking was threatened with ruin, the Marquis of Cernay and the Prince of Croix interested themselves in the concern in 1757. Then it was that the Anzin Company was formed. At that time the collieries produced 100,000 tons yearly; in 1865 they were 1,225,425 tons, and last year 2,058,522 tons; the number of miners employed being 12,491. The general management is in the hands of six partners, amongst whom is M. Thiers, as chairman, M. Cassimir Perier, and the Duc d'Audiffret Pasquier. Financially, the colliery was originally divided into 24 lots; and each of these was divisible into 12 deniers, which amounted to 288 social parts. In 1791 the denier was worth about 32,500l., and gave during the last few years an average revenue of from 2600l. to 3000l. After the French Revolution the company was reorganised in 288 parts, valued at 100,000 francs each. The dividends long kept between 8000 and 7000 francs per denier, and it was only towards 1853 that from 9000 to 10,000 francs was paid to the shareholders. From 1853 to 1864 the price of a denier seldom varied from about 150,000 francs; but in 1874 the parts attained 550,000 francs; in 1875, 940,000 francs; and since the beginning of 1876 the parts, or deniers, have varied from 800,000 to 875,000 francs. At the present day the hundredth part of a denier is worth 8000 francs, which paid 400 francs dividend for the year 1875. When the hundredth part of an Anzin share is worth 10,000 francs, the proprietor of a denier, which at the beginning of this century was valued at 4000l., will find himself the possessor of a stock worth 40,000l.—Whitehall Review.

THE COAL TRADE.

Mr. J. R. Scott, the Registrar of the London Coal Market, has published the following statistics of imports of coal into the port and district of London, by sea, railway, and canal, during October, 1876:—

1870.—		IMPORTS.		
By sea.	Ships.	Tons.	By Railway and Canal.	Tons c.
Newcastle.....	198	163,121	London & North-Western.....	124,760 18
Seaham.....	31	16,125	Great Northern.....	90,819 0
Sunderland.....	112	81,593	Great Western.....	51,886 0
Middlesbrough.....	4	979	Midland.....	152,934 0
Hartlepool.....	70	25,930	Great Eastern.....	55,796 4
Scotch.....	14	5,658	South-Western.....	2,374 2
Welsh.....	6	3,784	London, Chatham, & Dover.....	1,591 0
Yorkshire.....	32	2,991	South-Eastern.....	1,482 13
Smallcoal & cinders.....	32	6,978	Grand Junction Canal.....	556 0
Total.....	497	312,219	Total.....	250,980 2
Imports—Oct. 1875.....	410	244,320	Imports during Oct. 1875.....	415,450 0

Comparative Statement, 1875 and 1876.					
By Sea.			By Railway and Canal.		
	Ships.	Tons.			Tons.
Jan. 1 to Oct. 31, 1876.	4595	2,652,969	Jan. 1 to Oct. 31, 1876	4,219,206
Jan. 1 to Oct. 31, 1875.	4555	2,540,620	Jan. 1 to Oct. 31, 1875	4,057,354
Increase—present year	30	112,349	Increase in the present year..		191,852

Mr. Scott has also published an export list, showing the distribution of coal imported into the port or district of London by sea, rail, and canal, and afterwards exported coastwise or to foreign parts, or sent beyond limits of London district by rail or inland navigation, during October, 1876:—

EXPORTS.		Tons.
Railway-borne coal passing "in transitu" through district.....		92,752
Sea-borne coal exported to British possessions, or to foreign parts, or to the coast.....		38,465
Ditto, sent beyond limits by railway.....		10,204
Ditto, by canal and inland navigation.....		1,690= 50,259
Railway-borne coal exported to British possessions, or to foreign parts, or the coast.....		28,016
Ditto, by rail beyond district.....		22
Ditto, by canal and inland navigation.....		186= 26,224
Sea-borne coal brought into port and exported in same ships.....		719
Total quantity of coal conveyed beyond limits of coal duty district during October, 1876.....		169,954
Ditto, October, 1875.....		155,469

Comparative Statement, 1875 and 1876.		Tons.
Total distribution of coal from Jan. 1 to Oct. 31, 1876.....		1,579,518
Total distribution of coal from Jan. 1 to Oct. 31, 1875.....		1,466,308
Increase in the present year.....		113,210

General Statement, 1875 and 1876.		Tons.
Increase in coals imported by sea during the present year.....		112,349
Increase in ditto by railway.....		191,352= 304,201
Deduct increase in coals exported.....		113,210
Total increase in trade within London district during present year.....		190,986

"AMONGST MACHINES."—Much good is, no doubt, done by giving boys intended for mechanical pursuits such an outline of the general principles of machinery as shall interest them in the subject; and it is evidently with this object that the author of "The Young Mechanic" has written a companion volume (published by Trübner and Co., of Ludgate Hill), entitled "Amongst Machines;" a description of various mechanical appliances used in the manufacture of wood, metal, and other substances. The several subjects of iron, tilting and rolling, wire drawing, brass tubes, mechanical arrangements, mechanical powers, application of mechanical arrangements, and other mechanical expedients are in turn described, and reference is then made to various manufactures, steel pens, pins, hair-pins, sheet metal goods, screws, bolts, and nuts, machines for cutting and shaping wood, paper-making machines, glass-making and scientific machines, not the least instructive chapter being the concluding one, which in a very few pages gives an excellent outline of the mechanism of the human body. The work is professedly a book for boys, and will, unquestionably, prove acceptable to a large number of them, whilst it will give them, in a popular form, information which they might be disinclined to obtain from a dry and systematical treatise.

ELECTRIC TELEGRAPHS.—A novel construction of magnetic armature and its combination with an electro-magnet, whereby the electro-motive force created by an electric current is thoroughly utilised, has been invented by Messrs. R. and M. THEILER, of Canonbury-road, Islington. The magnetic armature may be made either of soft iron or of hardened magnetised steel. In the former case it is magnetised by induction from a steel or permanent electro-magnet, in the latter case the inducing magnet is dispensed with. When the armature is made of soft iron, two light tongues or bars of soft iron are mounted on a pivoted axle or are suspended on a thread or wire, their flat sides facing each other, and kept a certain distance apart by a short piece of brass or other non-magnetic substance to which the said tongues or bars are fixed in the middle of their length. This armature resembles, therefore, a kind of double tuning fork. The length of these tongues or bars is dependent on the distance the electro-magnet cores are placed from each other, and the amount of space between the prongs of the forks depends on the diameter of the said cores. The armature is magnetised by an inducing magnet in such manner that each tongue or bar has the same polarity at both extremities, the polarity of one tongue being, however, opposite to that of the other. When the armature is made of hardened and magnetised steel each tongue or bar is bent into a fork, thereby bringing the two and opposite poles of each tongue near one another. Now, if an electro-magnet with its cores protruding somewhat through the coils is placed in such a manner that its poles are inside the forks of the above-described armature, any electric current passing through the coils of the electro-magnet will exercise a quadruple influence upon the said armature. The pole of the electro-magnet will repel the pole and attract the pole of that side of the armature; the pole of the electro-magnet performing the same double function at the same time on the other side or extremity of the armature. Sometimes they let each tongue or bar turn on a separate instead of on a common centre. In that case they induce the bars or tongues with the same magnetic polarity, and screw the other pole of the inducing magnet to the pole of the electro-magnet. They also propose a novel construction of electric telegraph apparatus, writing or printing by the action of the electric current upon certain chemical solutions. In these electro-chemical telegraph the paper is generally steeped into this solutions days before being used so as to get it of a uniform wetness. This process is very troublesome and wet paper is very easily torn while running through the apparatus, and, moreover, corrodes and tarnishes all the metal parts of the machine coming in contact with the wet paper. To obviate all this, they steep the paper in the chemical solution, and dry it again before using it. This dry paper is then moistened while it runs through the apparatus by a sponge or other suitable means in connection with a reservoir filled with water, spirit, or any other liquid which will dissolve the chemicals contained in the paper. Or the reservoir may contain the chemical solution itself. If the paper is moistened with spirits or spirituous solution, or other highly evaporative liquid, the paper will get dry again very quickly.

PRACTICAL TUNNELLING.

From the constant necessity for systematic tunnelling operations in connection with the development of mining works upon the extensive scale usual in modern times such works as Simms' Practical Tunnelling* are almost invaluable. Mr. Clark remarks that as a monograph on tunnelling Mr. Simms' work stands unrivalled, and it is as useful now as it was on the day it was first published. At the same time, since those tunnels were completed a great deal of valuable experience has been accumulated in tunnelling, for many other tunnels have been constructed under different circumstances, and through ground of various geological formations. Other types of construction have been developed, of which it is scarcely necessary to state that the tunnel under the Col de Fréjus, commonly known as the Mont Cenis tunnel, above 7½ miles in length, is the greatest and most wonderful achievement of the time. The engineering construction of the Metropolitan Railway, popularly known as the Underground Railway, in London, is a unique performance, which most men pronounced impossible before the event, and this great work is only less admirable than the Mont Cenis Tunnel. In the portion of the work added since the previous edition was issued the system of driving tunnels known on the Continent as the English and the Belgian systems—based on the bottom heading and the top heading respectively—are carefully investigated. Then follows a discussion of the ordinary casualties in tunnelling, and is followed by details of the experience gained in tunnelling in clay, marl, &c., in coal formations and in hard rock. The St. Gothard Tunnel, now in course of construction, which will when completed have a length of 9½ miles, has been very fully described, the materials being for the most part drawn from the excellently prepared quarterly reports of the engineer.

From the introductory chapter it appears that the tunnel on the Langue-doc Canal, commenced in 1666, was one of the earliest instances of this description of work. The Hartshill Tunnel, on the Chesterfield Canal, 3000 yards long, and the Sapperton Tunnel, on the Thames and Severn navigation, 2½ miles long, and lined with masonry, are amongst the earliest constructions in England. The method of proceeding with tunnelling depends upon the kind of material to be excavated. The nature of the material is in ordinary circumstances ascertained approximately by means of boring and trial shafts, which are sunk from the surface over the axial line of the tunnel to be constructed through the intervening strata to the level of the lower part of the tunnel. Particular attention is required to be given to the practical geology of the material, whether rock, earth, chalk, or sand, and the skill of the engineer and the contractor is tested by the application of their knowledge of the subject to the development of safe and proper forms and proportions, as well as to the execution of the necessary works of construction. All unstratified rocks which are homogeneous and free from faults may be excavated, so as to leave the sides of the excavation vertical or nearly so, and thus a tunnel may be formed by merely driving a heading through the rock without the protection of an arch of masonry. It is generally only in such strata as clay-slate, granite, or other primary rock, that works can be left without artificial protection. In gneissous formations the walls of excavations may stand and endure unprotected, whilst it may be judicious and even necessary to line the arch. Mica schist, on the contrary, and particularly when loosened by distortion, most commonly requires to be substantially lined above the floor with masonry. But many stones whose strength and texture would, if they remained unaltered by exposure, enable them to stand forever, are affected by atmospheric air and moisture, and very speedily so by frost. Decomposed granite, called by miners potgroyan, is extremely troublesome in mining; it consists principally of felspar and potash, as does the china-clay or kaolin of the potteries. The substance appears to have been formed by the decomposing action of the air, or of chemically formed oxygen. Pyrites has a natural tendency to decomposition when exposed to the air, and it affects everything with which it comes in contact. Chalk is a material which, in those parts where it first crops out—that is, at the top of the stratum—has frequently given much trouble by reason of its inequality, and the common occurrence of potholes of loose gravel which, when unduly charged with water, break away the surrounding chalk. The presence of chalk veins in the mica schist formations of the St. Gothard mountain have been found to expose the rock to decomposition when opened to the air by the excavation of the tunnel. The diluvial strata are from their nature the least compact, and therefore require the most careful treatment. The alteration, too, in their position, which at some remote period of time has uplifted and distorted the original horizontal strata, renders them liable to further change of form by facilitating the operation of water—the element to which they owe their formation originally, and to whose continued action they seem peculiarly susceptible. Of these formations the most solid are gravel and sand. The other soils of this class are extremely variable. Some clays are firm and tenacious, others of a marly character are slippery; while quicksands and peat are proverbially treacherous. Clays, too, may be intersected by porous veins, which act as conduits for water. The London clay has a notorious reputation with well-sinkers; even in the absence of moisture if the clay be left exposed to the air for a few hours it expands and bulges inward. A well at Richmond of 4 ft. diameter was completely closed in one night by the swelling up of the bottom, although there was not any water in it. In mining operations the expansion of clay is well understood. The floors of old mines are always expected to swell upwards. The action of the air upon shale is well known; shale, though so tough and hard underground as to require the agency of gunpowder for its excavation, swells when uncovered, and becomes after a few weeks exposure to damp and atmospheric action thoroughly decomposed, and falls to powder.

In the main portion of the book the geological features of the South-Eastern Railway are described, and a general account is given of the Blechingley and Saltwood tunnels, the observations made by geologists during the construction of the line having permitted of a very accurate and complete statement being made. In the second chapter is a description of the transit instrument, and the method of fixing and adjusting it is explained, the mode of using the instrument and securing accuracy being described with equal care. Having described the method of keeping the works straight in a horizontal direction, he explains how to make it correct in a vertical direction or preserve the proper level. The fourth chapter explains the methods of shaft sinking in connection with tunnelling operations—the trial shafts being chiefly considered—whilst in the succeeding chapter the mode of excavating and constructing the working shafts and supporting the brickwork by shaft sills and hanging rods. There is an interesting chapter on driving the headings, and some valuable estimates of cost. It appears that by horse labour it costs 285d. per ton to lift water and stuff an average of 104 ft. There is a chapter on excavation and timbering, and others on putting in the brickwork and finishing the tunnel with the junction lengths. In the portion of the work contributed by Mr. D. K. Clark the relative advantages under varying circumstances of the English and the Belgian systems—the bottom heading and the top heading—is discussed, and he remarks that the greatest disadvantage of the system of bottom headings and break-ups in certain grounds consists in the lengthened exposure of the surface of the excavation to the action of the air, which in clays, marls, and shales loosens the ground, and in rock opens the fissures. A chapter is devoted to casualties in tunnelling, which will prove of great practical utility in suggesting some of the obstacles likely to be encountered. The chapter on the enlargement of railway tunnels is of considerable interest, as showing the peculiar difficulties arising from the disturbance of soils which had already been disturbed, and more or less displaced before. In the chapters on tunnelling in hard rock reference is made to the tunnels on the aqueduct of the Glasgow Waterworks, to the Clifton tunnel, to the Mont Cenis, and to the St. Gothard, and with regard

to the latter work very complete details are given both as to the compressors, drills, &c., used, and as to the results obtained.

The work altogether gives evidence of the editor having devoted a large amount of labour to the revision and extension of the original treatise, and as the details are given with much minuteness, especially with regard to the most recent and approved practice—those details being made remarkably clear by the numerous illustrations accompanying them, the engineer who takes the book for his guide need have little fear of falling into error, or of being unable to cope with the many obstacles he is sure to meet with in carrying out his work. It is a really valuable volume for reference.

BESSEMER CONVERTING VESSELS.

An invention which promises to be of importance in relation to the bottoms of the converters used in the Bessemer process for the conversion of cast-iron into malleable iron and steel has been patented by Mr. JOHN COLLINS, of Bolton. It has for its object the constructing of the bottom in such a manner as to render the wear and tear in use more uniform, to reduce the cost, and prolong the "life" of the "bottom," whilst saving the time expended in frequent renewals. In order to effect these objects he dispenses with the use of previously prepared fire-clay tuyeres, and forms a homogeneous bottom with the tuyeres in one therewith, and he employs a more highly and uniformly refractory mixture as a material, and further adopts an improved method of preparing the bottom. In carrying out the invention he selects a highly silicious rock, such, for example, as that used in the manufacture of the best silica bricks, and grind it to a uniform coarseness adapted for the purpose. This rock, which is known as a millstone grit or gannister, should contain not less than, say, 92 per cent. of silica. He prefers the "lychreda" rock for the purpose. To this ground rock he adds by preference, say, from 3 to 12 per cent. of well selected and washed fire-clay.

A special arrangement is made for moulding the bottom. He prepares a moulding box corresponding in internal size and shape to the bottom, and capable of resisting a pressure of (say) at least 2 tons to the square inch without fracture. This box is provided with a loose bottom plate, and he prepares a top plate to fit inside the box, which latter plate is furnished with taper studs of the diameter and number required by the special circumstances of the blowing to be effected by the vessel, that is to say, corresponding to the tuyere holes to be produced. The studs are made of a taper sufficient to clear well, and are also formed with a slight twist or spiral in their length. The length is such as to pass through the bottom in the direction of its thickness, and to leave a margin. He then fills the box so prepared with the mixture or material above described, and fits on the lid, and subject the whole to the action of a powerful hydraulic press (applying a pressure of (say) not less than 2 tons to the square inch), and immediately imparts a slight turn to the studs by suitable mechanical means while the mixture is under the said pressure. He then removes the pressure, withdraws the studs and the box, and subsequently stoves the bottom for a period of (say) not less than 48 hours, after which the bottom is ready for use.

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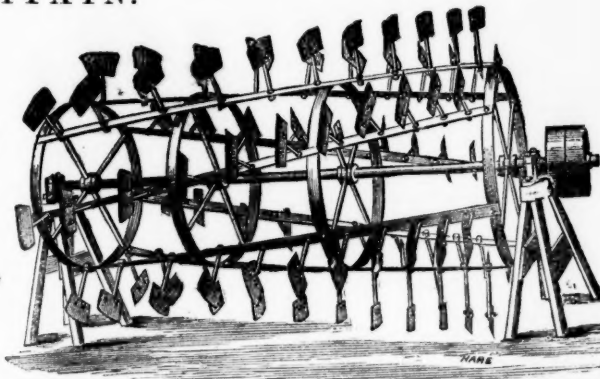
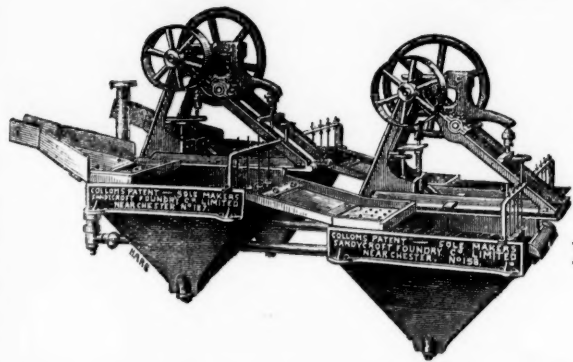
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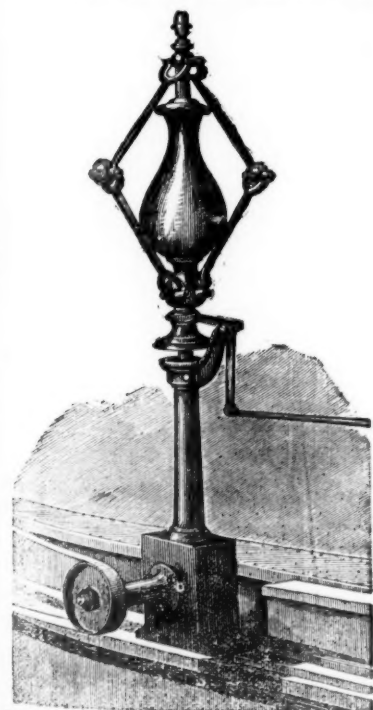
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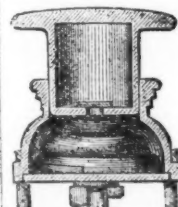
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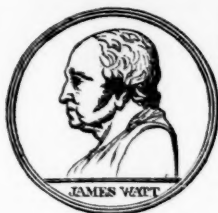
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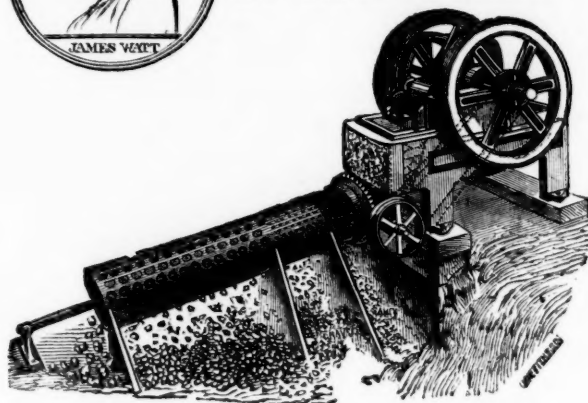


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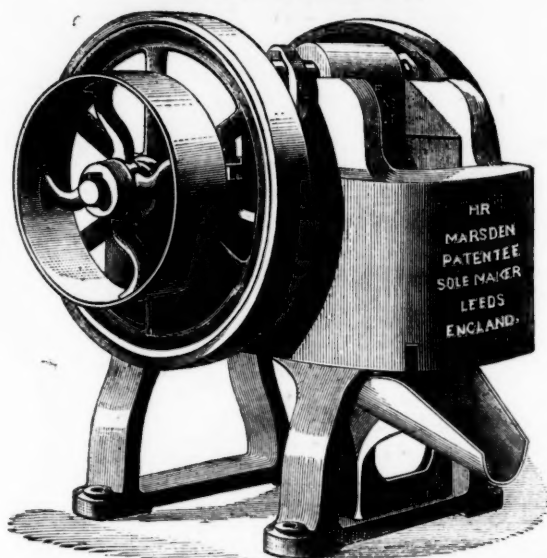
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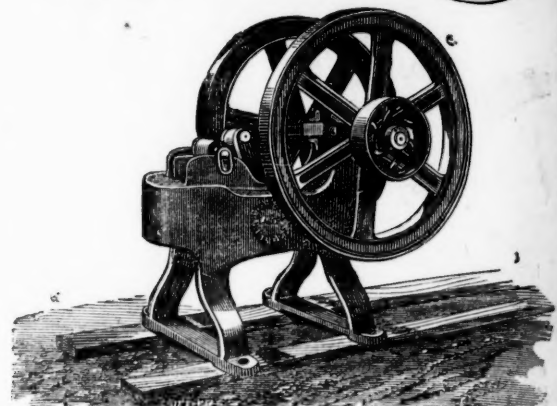
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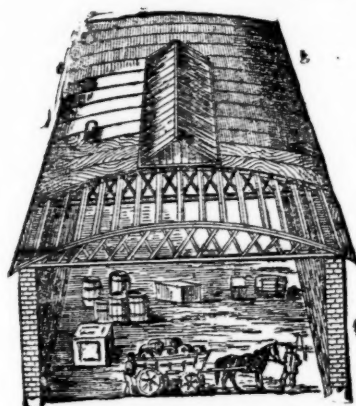


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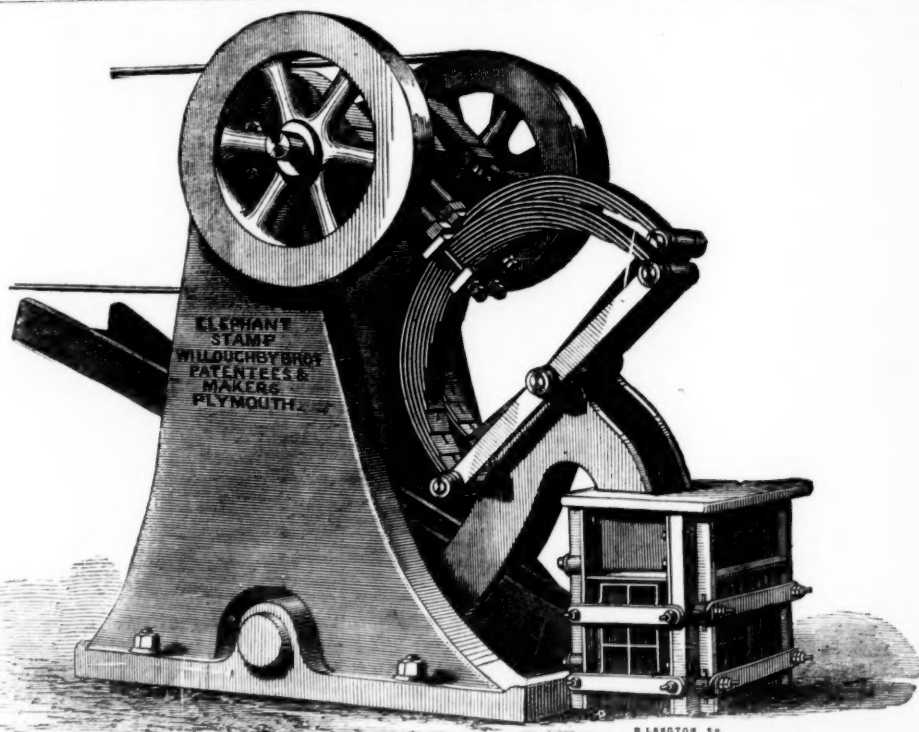
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